JOURNAL OF ELECTRICITY

POWER AND GAS

Devoted to the Conversion, Transmission and Distribution of Energy

Entered as second class matter May 7, 1906, at the Post Office at San Francisco, Cal., under the act of Congress March 3, 1879.

VOL. XXXV NO. 14 | SAN FRANCISCO, OCTOBER 2, 1915 | PER COPY, 25 CENTS

THE NECESSITY FOR WATER POWER DEVELOPMENT

BY HENRY J. PIERCE.

PROCEEDINGS OF INTERNATIONAL ENGINEERING CONGRESS

REPORT OF WESTERN STATES WATER POWER CONFERENCE

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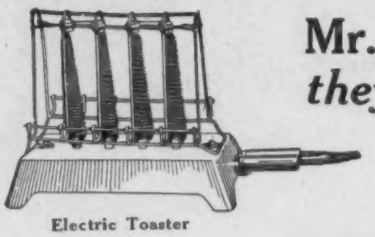

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JOURNAL OF ELECTRICITY
POWER AND GAS
Devoted to the Conversion, Transmission and Distribution of Energy

VOLUME XXXV SAN FRANCISCO, OCTOBER 2, 1915 NUMBER 14

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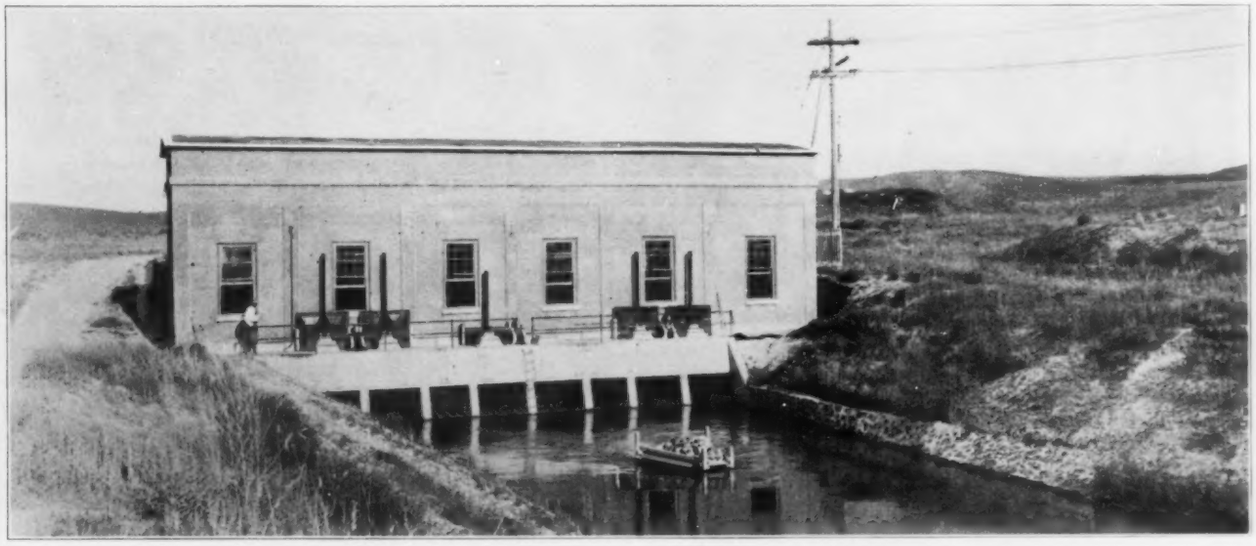
THE NECESSITY FOR WATER POWER DEVELOPMENT

BY HENRY J. PIERCE.

(This admirable summary of lost opportunity forms a fitting introduction to the proceedings of the Water Power Conference, as reported elsewhere in this issue. It is taken from an address delivered at the conference by the author, who is president of the Priest Rapids Irrigation Co. of Washington. —The Editor.)

It is a strange fact that the proportion of our total available water power thus far developed is only about the same as was the proportion of our agricultural lands under cultivation one hundred years ago. Today, while all the farming lands of the United States, with the exception of the arid portions of the West, have been brought under cultivation, and while such great natural resources as coal, oil, phosphate and minerals have been developed as rapidly as necessity required, yet but ten per cent of our available water power has been utilized.



Irrigation Pumping Plant on Minidoka Project, Idaho.

Up to 1885, when electricity was first utilized for practical purposes, the use of water power was limited to the turning of wheels for operation of a few grist mills and other manufacturing establishments. During the thirty year period between 1885 and 1915 6,000,000 h.p. was developed out of a total available amount of 61,678,000 h.p. As the principal use for electric energy has been the operation of public utilities, the water powers thus far utilized have been those located at points nearest large centers of population, though in some instances power is being economically transmitted in large quantities for distances of from 150 to 200 miles.

The U. S. Geological Survey estimates that 44,049,000 h.p. or 71 per cent of the total potential available horsepower in the United States, is contained within the states of Washington, Oregon, California, Montana, Wyoming, Idaho, Colorado, Utah and Nevada, and of this vast amount but 1,622,021 h.p., or 3.68 per cent, is now being utilized,

The total available water power of all countries of Europe combined is 35,965,000 h.p. the development of which is rapidly progressing.

Three great principal uses for electric energy await the development of our water powers: The operation of pumping plants in connection with irrigation projects; the electrification of railroads; for manufacturing purposes in production of fertilizers, explosives and electro-chemicals, wood pulp, paper, iron, steel, etc.

Irrigation. It is estimated that there are at least 10,000,000 acres of arid lands located in the Far Western states, lying above the reach of gravity water

that can only be reclaimed through water raised by pumps operated by the cheap hydroelectric power now latent and wasting in the various streams from which the water would be pumped. Thus the land, and at a lower level the water to irrigate it, and the power to raise the water to the land are often all assembled at one point. Given water, these lands will produce every fruit, vegetable and grain that is native to the temperate zone, and are capable of supporting a population of 2,000,000 people. If capital can be safeguarded, it is safe to say that hundreds of thousands of water horsepower will be utilized within the next ten years in connection with the reclamation of arid lands, and that in addition to what the government service will accomplish, hundreds of millions of dollars of private capital will be used for establishment of reclamation projects in connection with pumping plants. Lands are being irrigated in twenty-seven states, and as far east as New Jersey and Florida and two Western states have now nearly 5,000,000 acres of land under irrigation.

Electrical Nitrogen Furnaces in Norway.

Electrification of railroads. Four hundred and fifty miles of the main line of the Chicago, Milwaukee & St. Paul Railroad, being the portion between Harlowtown, Montana, and Avery, Idaho, is now being equipped for operation by electricity. Quoting from the testimony given before the Senate Public Lands Committee in 1914 by John D. Ryan, a director of the Milwaukee Railroad and also president of the Montana Power Company, which will furnish the power:

"The railroad will pay under the contract for power delivered over 450 miles of its road something like $550,000 a year. It is paying now for coal to operate its steam trains over the same line approximately $1,750,000, and they furnish their own coal from mines on their own road, and one-third of their equipment is used in hauling coal to themselves, whereas with electric power there is not any such waste. It will save coal in the ground, and an enormous amount of money, and will be utilizing an absolutely waste product."

Mr. Ryan also testified that the Butte, Anaconda & Pacific Railroad are paying $96,000 per year for electric energy to operate 80 miles of road as against a former cost for coal of $270,000, a saving of $174,000 annually.

In view of the great and apparently sure economical success of the electrification of 450 miles of the Milwaukee line, it is almost certain that within the next ten years a majority of the railroads operating through the mountainous country of the Far West, where hydroelectric power can be developed cheaply, will adopt electricity as motive power. As 48,700 miles of railroad are now being operated in the states west of the Rockies and as it is estimated that 10,000 h.p. is needed to operate 100 miles of single track, it therefore would require 4,870,000 h.p. to electrify all of the railroads of these states, or one-ninth of the total hydroelectric power possible to de-

velop in the territory traversed by these railroads. A great portion of the trackage is over mountain divisions, and the use of electricity in place of coal will result in great economy of operation, obviate the danger of forest fires, and by elimination of noise and smoke and through a more generous ventilation, which will be possible when the flying cinder need no longer be taken into account, will make travel far more comfortable than at present. As the railroads consume 20 per cent of the total coal used for all purposes, the substitution of electricity for coal as motive power will conserve this enormous amount of fuel for future use and water power wasted from the beginning of time will be utilized.

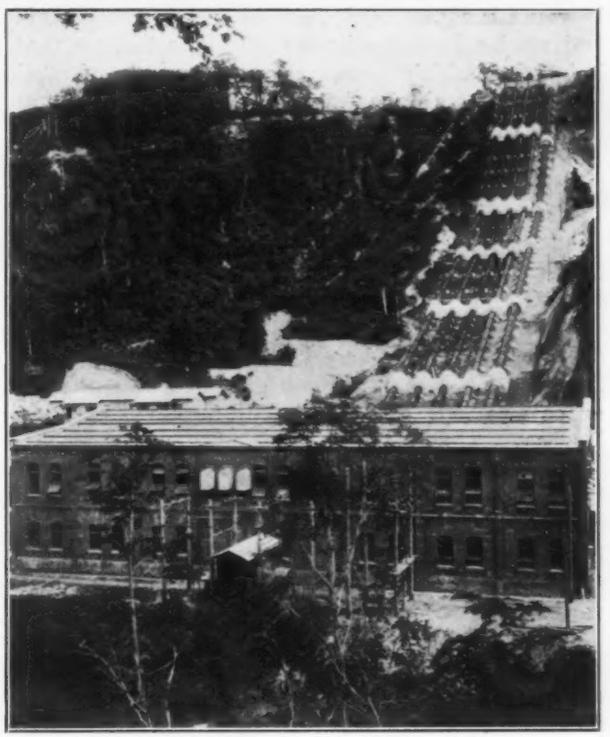
Production of fixed nitrogen. The greatest need for the development of our water powers is the imperative necessity, and it is a national necessity, that sufficient fixed nitrogen should be produced within the boundaries of the United States to meet its requirements. During 1913, the United States imported 625,000 tons of Chilean nitrates, valued at $21,000,000, upon which the Chilean export duty was 60 per cent. We thus paid to the Chilean government $12,600,000, which may be considered merely a part of the amount which the people of the United States pay for its policy of water power stagnation. In other words, the people of this country would be quite as well off as they are, if they granted a subsidy or bonus of $12,600,000 per annum for the establishment of the water power nitrogen industry in the United States. The richest nitrate beds of Chile, however, will be practically exhausted by 1923; and were it not for the discovery of processes whereby it is now possible, with the aid of electric energy, to obtain supplies of fixed nitrogen from the atmosphere, the world would stand in iminent deadly peril, and the perpetuation of the human race would be endangered.

The governmental paralysis imposed seven years ago upon the development of water powers in the United States, through the restrictive interpretation of federal laws, and through harsh regulations of federal departments, still continues; but that period has been one of great hydroelectric development in Europe, where over 1,200,000 water h.p. has been utilized for the extraction of nitrogen from the atmosphere, while not a single horsepower is being used in the United States for that purpose. On account of our restrictive regulations, a great atmospheric nitrogen plant was established several years ago at Niagara Falls, Canada, instead of on the Coosa River in Alabama, where the builders would have preferred to locate it. In anticipation of a change in our federal water power laws, a company was organized during the winter of 1914-1915, which expected to build nitrogen plants in the south and on the Pacific Coast, which would have cost upwards of $35,000,000, but owing to the failure of the 63d Congress to enact practical legislation, the attention of the organizers has been turned toward the development of Canadian water powers.

The two largest and most necessary uses for nitrogen are in connection with the manufacture of fertilizers and explosives. Seven million tons of fertilizer, valued at $170,000,000 were sold in the United States during 1913, and for its manufacture over $40,000,000 of nitrogenous and other material was imported, most of which could have been made in this country, with the aid of electricity. The average amount of fertilizer used in the United States is 28 pounds per acre of cultivated lands, against 200 pounds per acre in Europe.

Nitrogen, in the form of nitric acid, is the principal constituent of explosives, such as gun cotton, dynamite and smokeless powder. We are annually producing about 250,000 tons of explosives valued at $40,000,000, and we pay $23,000,000 for the raw materials that enter into them, most of which are imported. Had it not been for the discovery of the nitrate fields of Chile, the explosive industry, as it is known today, would have been impossible; and, as coal and minerals could not have been mined without the use of explosives, the development in mining and transportation, which have characterized the last half century, could not have been made. In case of war, we would be almost entirely dependent upon foreign nations for our supply of nitrogen for manufacture of powder, and would be practically defenseless unless we could obtain it from other nations. Germany is shut off from supplies of Chilean nitrate for powder making, and if she had not developed her water-powers, for the purpose of obtaining nitrogen from the air, the European war would be ended today and Germany beaten. But the German government has taken over all nitrogen fixation plants and is operating them on a war basis, and thus is enabled to manufacture a plentiful supply of ammunition.

Paper and wood pulp. One-third of the cost of manufacturing wood pulp and paper consists of the cost of power. The imports of these articles into the



Japanese Hydroelectric Plant for Paper Mill.

United States are growing at an enormous rate. Sweden and Canada have been developing their water powers, and hence it is interesting to note the exports

of wood pulp and paper from those countries to the United States:

	1911.	1912.	1913.
From Sweden	84,378 tons	107,884 tons	130,693 tons
From Canada	83,856 tons	131,412 tons	281,586 tons

With the production of cheap electric energy, through the development of our water powers, the pulp and paper industry will come back to its own in the United States. It is inevitable that the industry must spread westward, and that through the utilization of the water powers and the forests of the Northwest, these imports of wood pulp and paper will be displaced with products made in our own country.

Iron smelting. While coal, coke and gas are principally used in the smelting and refining of iron and steel, and while one-fourth of the entire world's output of coal is used for that purpose, yet in 1913, 668,000 tons of steel were produced in Europe and 165,000 tons in the United States, through the use of the electric furnace. In Alabama and Tennessee, practically inexhaustible deposits of iron ore and limestones are located in the vicinity of great undeveloped water powers, and when the problem of making pig iron through the use of cheap electricity is solved, in an economical way, the South will become the center of the metallurgical industry. Students of the question believe that the use of cheap hydroelectric power, in the making of iron, will eventually bring about a commercial revolution in the leading nations. The United States, Germany and England produce seven-eighth's of the world's iron. Germany has already develped practically all of her water powers, England has but few, and the production of iron would, therefore, under these circumstances, pass into the hands of the United States because of its water powers and it would become omnipotent in the production of iron and steel. In fact, these authorities believe that all industries, which consume large amounts of mechanical energy, will be forced to emigrate to countries where water power is abundant.

Calcium carbide. Over 200,000 homes are lighted by acetylene gas, produced from calcium carbide, in the manufacture of which, at Niagara Falls, great quantities of hydroelectric energy are used. Because of our restrictive water power laws, the American Carbide Company could not increase its production in this country, and is now building a plant on the sea coast of Norway, where it has contracted for the delivery of 80,000 h.p. developed from water power, and expects to ship most of its product to the United States.

Electro-chemical products were reported by the last census to be made in thirty-four establishments, of a value of $18,450,000, consisting of abrasives, electrodes, calcium carbide, caustic soda, chlorates and such metals and alloys as aluminum, silicon, ferro-vanadium, ferro-silicon, etc.

Latent Water Powers.

With the abolition of our present faulty laws, and the enactment of practical legislation, great water power developments which have been held back for years, would be undertaken on the Connecticut River, where the power would be used in operating the mills of New England; on the Tennessee and Coosa Rivers of the South, in connection with the manufacture of fertilizers, iron and steel; on the upper reaches of the Mississippi for public utility uses; and on the Columbia and Snake Rivers of the Northwest for irrigation and manufacturing purposes. Through installation of power dams and of locks, these rivers would be made navigable for an aggregate of hundreds of miles further into the interior of the country, and it would be accomplished by private capital, without a cent of cost to the people through government taxation.

But while an enormous amount of water power is latent in our navigable rivers, a far greater amount exists in the non-navigable streams flowing through the public lands and Federal reserves located in the Far Western States. Here Nature has segregated her natural resources; the thirsty land awaiting irrigation with the water containing the latent water power washing its shores; the forests necessary to manufacture of wood pulp and paper lining the banks of the falling water, the limestone and phosphate needed for fertilizers and explosives located contiguous to wasting water powers.

Backed by the necessary capital, men of business and of technical and scientific experience, who have made hydroelectric development their life work, as well as manufacturers of all of the great products for which the hydroelectric energy would be used, stand ready to undertake this vast commercial development as soon as our present impossible federal laws are corrected to a fair business basis, under which practical men will give their time and capital will invest.

Legislation Needed.

To be of avail, federal legislation governing water power development must be of a nature to protect the public interest, accord to the states their just rights, be fair and business-like toward capital, and place not a featherweight more burden on the operation of water powers located within the public domain than are borne by competing hydroelectric developments operating outside the federal reserves. There is no reason why these things should not be so co-ordinated as to protect every interest and bring results.

It is thus apparent that there is vital and imperative necessity for promoting and encouraging in every way the development and utilization of the enormous quantity of energy latent in our streams and now wasting to the sea; a necessity in no way local, but national; affecting the farmer on the Kansas prairie and the resident of New York City just as much as the citizens of the states where the water powers are located. It is necessary for the manufacture of ammunition for the national defense; necessary for the manufacture of fertilizers that the cost of living may be decreased through increase of crops; necessary for the electrification of railroads for the cheap carrying of freight, and to provide a means of rapid and comfortable transportation for the people; necessary to the irrigation of vast tracts of lands, meaning the building of thousands of homes on lands now silent; necessary to the establishment of great and entirely new industries in the United States, meaning the investment of hundreds of millions of dollars, the building of new cities and towns, and the employment of thousands of men and women; necessary if we are to maintain our commercial standing among the manufacturing nations of the earth; and finally, of vital necessity toward promoting the comfort, the welfare and the prosperity of every citizen of the United States.

INTERNATIONAL ENGINEERING CONGRESS

The International Engineering Congress at San Francisco was called to order at 10 a. m. September 20, 1915, by Chairman W. F. Durand, who said that the congress represented the fruition of four years of hope and preparation on the part of the engineers of San Francisco. He briefly outlined the history of the inception of the congress, its organization and development, notwithstanding the deplorable conditions in Europe. As the central inspiration of the congress had been furnished by the Panama Canal, which had been directed and brought to a successful conclusion by General G. W. Goethals, he was introduced as the honorary president.

General Goethals, after expressing his appreciation of the honor thus conferred, introduced Mayor Rolph of San Francisco, who extended a cordial welcome to the delegates. In so doing he called attention to the engineering accomplishments in the city, including the auxiliary fire protection system, tunnels, plans for the Hetch Hetchy water and power supply, municipal street railway and the civic center.

Chas. C. Moore, president of the Panama-Pacific International Exposition, spoke briefly about the exposition.

General Goethals spoke of the Canal as an engineering accomplishment, telling of its history and of the difficulties overcome, giving special tribute to the eradication of yellow fever and malaria. He outlined the details of the working organization, showing that the canal is another illustration of the function of the engineer in that he uses the forces and materials of nature for the benefit of man. "It is an example also that engineers are fitted for great administrative and executive functions, and also that they can, if the government be a proper one, manipulate a government to the satisfaction of those governed." An engineer was made governor of the Zone, "and I am now hoping that my successor will be an engineer and that an engineer always will be in control on the Zone."

Major Jean L. De Pulligny was then introduced as the representative of the French government, who in an inspiring address, congratulated America upon the holding of the congress and extended the greetings of France.

J. B. Challies, superintendent of the Dominion Water Power Branch, as representative of the Dominion of Canada and the Canadian Society of Engineers, prophesied that the spirit of the great congress would remain as a potent influence for the advancement of engineering throughout the world, long after the Exposition had disappeared.

Senor Villajon, the delegate from Cuba, expressed his appreciation of the opportunity to participate in the congress. Admiral Wei Ham of the Chinese Navy likewise congratulated America on its accomplishment in building the canal.

Senor Don Fernando Cruz, a delegate from Guatemala, told of the mining conditions in his country and wished the congress all success.

Admiral Kondo, as the representative of Japan, M. Wenkelbach of the Netherlands, Senor Caton of Nicaragua, Senor de Loti of Spain, Mr. R. Bernstrom of Sweden and Mr. Rohn of Switzerland made remarks of similar import.

The opening session then adjourned after the reading of announcements by Secretary W. A. Cattell.

The congress was then subdivided into eleven sections which held parallel meetings during the balance of the week.

The first of these was devoted to the Panama Canal, an introductory paper on which was read by Major General G. W. Goethals. Papers were read on its commercial and trade aspects, its working force, the purchase of supplies, geology, climatology and hydrology. The first two sessions of the waterways session were also devoted to this subject, including methods of dry excavation, dredging construction at Gatun and at the Pacific division. Special attention was devoted to the design and construction of lock gates, chain fenders, lock entrance caissons, lock wells, valves, spillways, emergency dams and hydraulics of the locking operations. The papers in each case were written by the men in charge of the work. In a subsequent session of the municipal engineering section, papers were read regarding municipal engineering, domestic water supply and sanitation in the Zone. The railway section gave consideration to the reconstruction of the Panama railroad and the electrical section to electrical and mechanical installation of the Panama Canal.

The waterways section also discussed the province of waterways in the internal commerce and development of a country, cut-offs on marine routes, inside routes, waterways of the German Rhine, flood control, improvement of navigable estuaries and river improvement works in Japan.

Abstracts of the papers and discussions on some in the other sections which are judged to be of peculiar interest to the readers of this journal are given in the following pages.

In addition to the technical sessions a number of entertainment features were provided. These included a reception to General Goethals and the vice-presidents of the congress on Monday night, a banquet on Friday night and various trips of inspection to the Exposition and other points of interest during the week.

The congress was brought to a formal close Saturday noon with words of farewell from the officials of the congress and the distinguished foreign delegates who were in attendance. A cable was sent in the name of the congress to the family of de Lesseps, the builder of the Suez Canal and the pioneer at Panama. Thus was brought to a close this most successful meeting.

ELECTRICAL ENGINEERING.

Economics of Electrical Power Station Design.

H. F. Parshall discussed the conditions under which centralization of power supply may take place and thus justify the use of larger steam turbines with their attendant economies. These economies are chiefly dependent upon the load factor and also upon the installed capacity. The effect of these two factors upon capital cost, thermal efficiency, coal costs and capital charges per unit, were discussed and illustrated by curves. Load factor is also an important determinant in locating a plant, the advantage of a site with good coaling and condensing facilities being balanced against the cost of transmission to the area of supply. The curves showing these relations as well as all other curves in the paper deal solely with English conditions. The variation in steam pressure, super-heat and exhaust vacuum as it effects the efficiency of the Rankine steam cycle was shown. The subject of economizers and artificial draft as dependent upon load factor are fully discussed. The paper concludes with a resume of the conditions whereby London has become distinguished by reason of the economic waste that has arisen from de-centralization of electric generation.

In the absence of Mr. Parshall, the paper was read in abstract by Mr. H. H. Barnes of New York City. D. B. Rushmore, in opening the discussion, showed that certain fundamental principles governed the design of power stations. The uncertainty of actual future conditions required that the station be constructed to meet any emergency or break down. The specific case of auxiliary design, cited by Mr. Parshall, illustrated the general rule for independence of action. While the efficiency of the power station is approaching the highest limit the cost of transportation, transmission and distribution can be greatly reduced. It represents a large field for future effort.

C. R. Weymouth, chief engineer for C. C. Moore & Co., stated that Mr. Parshall's ideas of high steam pressure and superheat were somewhat new in Pacific Coast practice. It is advisable to design the plant for higher pressures and superheat in order to meet future needs. He showed the limitations of turbine driven auxiliaries for small plants, their steam consumption being disproportionately high. As the load on the station is decreased the percentage of steam waste from auxiliaries increases. He also urged that special attention be paid to the design of speed control apparatus.

H. H. Barnes said there was a tendency to greatly increase steam pressure from the 175 to 200 lb. formerly regarded as standard. He told of H. G. Stott's studies of pressures as high as 1000 lb. in order that from 30,000 to 40,000 kw. be generated in one unit. He prophesied that much higher pressures will be feasible and economic in the near future.

W. J. Davis of San Francisco stated, that as the efficiency limit of steam turbines and condensers had already been reached, the great economies of the future must be made in the boiler room by increasing the working range of temperatures. He stated that increased steam pressure leads to difficulties in the design of turbines and auxiliaries and suggested that electric drive be employed for the latter because of its simplicity and cheapness.

R. Tschentschner of Chicago, contrasted the conditions found in large industrial plants, where power production is a side line, with those in public utilities where it is the main product. He stated that the low standard of operatives at industrial power plants required that the simpler reciprocating engine be given preference to turbines in driving auxiliaries.

The Water Power of Sweden.

Sven Lubeck, president Svenska Teknologforeningen, Stockholm, traced the general development of hydroelectric power in Sweden, where 850,000 h.p. are in operation or under construction. This is utilized chiefly in the iron, timber, pulp, textile and electro-chemical industries, as well as in railway operation. Capital costs per effective horsepower varying from $13.50 to $27.50. Over 3000 miles of transmission lines are in service. An appendix gave detailed descriptions of twelve large installations under private and governmental ownership. A brief summary was also given of regulations for development.

Selby Haar of Chicago stated that the Porjus plant represented the only instance of a single-phase high tension plant, 80,000 being the operating voltage.

J. W. Beckman of San Francisco stated that Mr. Lubeck's paper should be stimulating to Pacific Coast engineers, who not only have great powers available, but raw materials close at hand, without Sweden's necessity of importing them. He showed the advantage of Pacific Coast climate as compared with that in Sweden, and of the ability to utilize home capital rather than foreign in developing the industry.

Electric Power in Canadian Industry.

Chas. M. Mitchell, consulting engineer to Dominion Water Power Branch, Canadian Department of the Interior, presented a statistical report of the use of Canada's 1,712,193 electrical horsepower. Details are given of the development by the Hydroelectric Commission of Ontario, together with curves showing growth of power loads for important centers.

In discussing Mr. Mitchell's paper Mr. L. T. Robinson inquired whether the load curve shown in the paper represented actual conditions. He was assured, in answer, that it was a typical one taken by a graphic meter. In answer to a question by Mr. Summerhayes, Mr. Mitchell stated that the cost of supplying power cited in the paper did not include line losses.

Effect of Hydroelectric Power Transmission.

Frank G. Baum, consulting engineer at San Francisco, discussed the effect of hydroelectric power transmission upon economic and social conditions with special reference to the United States of America. After demonstrating that modern progress is dependent upon the utilization of mechanical energy instead of human or animal energy and after quoting statistics indicating the superlative value of electricity in the new era of efficient development he urges that the power of falling water, which nature is annually renewing, be used instead of consuming wood, coal, oil and other non-replenishable sources of power. As a result of great central stations and transmission line networks he believes that the electrical age will represent the end of human progress in efficiency.

In discussing Mr. Baum's paper Mr. John Coffee Hays of San Francisco stated that Mr. Baum's statements regarding the Mt. Whitney Power & Electric Company could not be taken as a fair example of the results to be obtained in an ordinary hydroelectric plant unless a great effort were put forward by the commercial department in running long lines and in developing the country. He showed that the electric

power company must act almost as the banker in financing small consumers. He criticized Mr. Baum and many other engineers using the term "cheap hydroelectric power," stating that there was no such thing in California. There was no water power project in this state, of any magnitude, where power can be developed, transmitted and marketed for less than $200 per h.p. of installed capacity. A modern steam plant with low priced fuel oil produces current almost as cheaply.

J. B. Fisken showed that Mr. Baum's prophecy as to the electrification of main line railroads was already being fulfilled in Montana. He thought that his suggestion that power was being sold at a profit to the consumer should be given wide notice, particularly among the public service commissions. The prediction as to tying together all transmission systems would be hampered by the presence of municipally owned plants, where politics prevented good results from being obtained. He emphasized the fact that the greater part of the cost for supplying power to the small consumer is in the distribution system. He spoke of the regulations at Spokane which required a minimum rate of 70c for small consumers whereas the average cost to the company is $1.25. He emphasized the fact that power companies were being greatly hampered by rules prepared by non-technical commissions.

Application of Electricity to Heating of Metals.

F. L. Bishop, dean of the School of Engineering at the University of Pittsburg, illustrates and describes various types of electric furnaces for laboratory and commercial use. These include the resistance furnace for heating small devices which form part of the circuit, those furnaces such as the Hereaus, the Arsen, the Borchers, the Watt, the Sossman, the Bailey and the molten salt furnaces, all of which depend upon passing the current through a resistance material whence the heat is radiated and conducted to the metal, and the type whereby the metal is heated by eddy currents from a surrounding a.c. circuit.

Mr. Bishop's paper was abstracted by R. A. Balzari. J. B. Fisken stated that mines use two types of electric furnaces. The muffle furnace should have a great application in metallurgy because of its constancy of temperature. An electric furnace for heating drills would be superior to an oil furnace as the electric current is more esily delivered in the mountains than oil.

The Electric Motor as an Economic Factor in Industrial Life.

David B. Rushmore, chief engineer power and mining department General Electric Company, after briefly tracing the historic development of power apparatus, listed the advantages of electric motor drive, giving tabulated statistics of its uses in various industries. Motors were classified as to type and operating characteristics and special information given on control equipment. The principal industries and classes of service using motor drive were listed together with an outline of the features common to all industries.

In discussing Mr. Rushmore's paper S. V. Walton stated that it was another evidence of the fact that the electrical engineer is thinking of commercial matters. He also spoke of the increasing importance of electricity in agricultural engineering.

J. F. Stevens of Philadelphia called attention to the great field for electric power in agricultural chemistry.

Electric Welding.

C. B. Auel of Westinghouse Electric & Manufacturing Company, Pittsburg, presented a careful analysis of the various processes employed, treating respectively of the arc, the incandescent and the electro-percussive methods. Under the arc processes full details of methods and results were given for the Zerener, Bernardos and Slavianoff processes which differ in the method of drawing the arc, two carbon rods being used as electrodes in the first, a carbon rod and the metal to be welded in the second, and a metal rod and the metal to be welded in the third. Under incandescent or resistance processes the direct current La Grange-Hohn and alternating current Thomson methods were described. Details were also given of the electro-percussive direct current method whereby the metals to be welded from the electrodes, being brought suddenly into percussive contact and vaporized.

M. Auel's paper was abstracted by F. D. Newbury. F. D. Weber of Portland told of an unsuccessful attempt by a steel cabinet box manufacturer to spot-weld the hinges on the boxes, one-fourth of the hinges breaking off during installation because of rough handling in installation. W. J. Davis suggested that some flux should be used in spot-welding to overcome the oxide film.

Electric Motor's Influence of Machine Tools.

A. L. De Deeuw of Elizabethport, N. J., stated that the application of the electric motor to machine tools was simultaneous with the introduction of high speed steel, whose requirements of greater speed, more power and better control had been met by the motor. It made the individual drive possible, it gave the first accurate indication of power consumption and has given better knowledge of the data governing the design of machine tools. It showed that the capacity of belts had been under-estimated and it started the investigation of the relation between the amount of cut and the amount of power. It furthermore has greatly increased the safety of operation.

Production of High Permeability in Iron.

Ernest Wilson, professor of electrical engineering at King's College, London, explained how Stalloy is made more permeable by the method of magnetic shielding and laminated squares or rings by a method of magnetic annealing. He raised the question whether this 50 per cent increase could be produced in strips which are afterwards subject to bending when used as transformer cores.

Electric Illuminants.

S. H. Blake of Schenectady, N. Y., recited the first progress and present status of electrical illuminants by means of a chronological review of the first thirty-five years. He showed that it was not until after twenty years had elapsed that any substitute was developed for carbon incandescence as a light source. By the end of the third decade carbon had lost its prominent position and luminiscence and selective radiation were employed. At present the gas filled incandescent lamp and the luminous arc represent the highest type of development. In the future he expects to see a utilization of the latent possibilities of the flame arc lamp and of luminous gases and vapors. The paper was concerned only with light sources and not their method of application.

Effects of Electrolysis on Engineering Structure.

Albert M. Ganz, professor of electrical engineering at Stevens Institute of Technology discussed the effect of elec trolysis from stray electric currents on electric railway tracks and supports, underground cable and piping systems and steel and concrete foundations giving suggestions for their mitigation. These include increasing the number of supply stations, increasing the conductance of the track, using insulated return feeders, insulating from the ground, the negative bus bar at the station and increasing the resistance between tracks and earth.

MECHANICAL ENGINEERING.

Internal Combustion Engines.

Professor C. E. Lucke of Columbia University reviewed the progress of the internal combustion engine during the past forty years, treating of its successive adaptions to the use of gasoline, producer gas and heavy oils. Statistics are given of the use of gas engines for transportation and stationary purposes. In the latter field the high thermal efficiency has been insufficient to advance the use of large sizes because of high initial cost as compared with steam turbines and of small sizes because of lack of convenience as compared to the electric motor. The paper was largely concerned with pointing out the difficulties which has been met in design and construction, with extended reference to fuel gasification.

Discussion on Prof. Lucke's paper was largely confined to the Diesel engine, with an extended account of the application of the Blackstone engine in India by R. Seshasayee. W. D. Peaslee of the Oregon Agricultural College urged that a high standard of workmanship and material be maintained.

Steam Turbines in the Netherlands.

D. Dresden, consulting mechanical engineer for Gebroeders, Stork & Company, Hengelo, The Netherlands, presented a detailed treatise on the design and operation of the Zoelly turbine as developed for driving generators, pumps and air compressors.

The 1915 Steam Turbine.

E. A. Fosberg of Stockholm, Sweden, described the design construction and operation of De Laval and Ljungstrom turbines in Sweden. The former has specialized on counter pressure and tapping turbines for operation with exhaust steam, while the latter holds the record for steam economy and has been great satisfaction in turbo-electric vessel propulsion. A 1000 kw. Ljungstrom turbine has a thermo-dynamic efficiency of 75 per cent, while 83.95 per cent has been attained by a 5000 kw. unit. It utilizes the reaction principle without stationary blades (there being two rotating bucket systems, both taking up energy from the steam flow and serving as guide vanes for each other.)

D. Dresder's and E. A. Forsberg's papers were discussed together. In answer to a question regarding the efficiency of special reduction methods, W. J. Davis, engineer with the San Francisco office of the General Electric Company, stated that the electrical method gave an efficiency of 98 per cent or better. It is well adapted for battleship use but for commercial vessels he advised mechanical reduction gears.

Geo. W. Dickie, consulting engineer at San Francisco, thought that there is a great future for electric drive even in the case of commercial vessels.

The Diesel Engine in America.

Max Rotter, chief engineer Busch-Sulzer Bros. Diesel Engine Company, St. Louis Mo., after explaining the Diesel principles, discussed recent developments in design and construction in America. Details of the Snow, Allis-Chalmers, McIntosh & Seymour, Fulton-Tosi, Dow, Fulton-Diesel, Harris and Busch-Sulzer engines are briefly discussed.

Discussion on Max Rotter's paper was opened by H. J. Kennedy of Seattle, who inquired as to the cost per brake horsepower.

R. Sehasayee of India gave details of operating costs in India.

The engineer for the municipal lighting plant at Palo Alto in reply to questions by A. H. Babcock told of his trouble with a 300 h.p., 4 cycle horizontal Koerting engine. In order to remove the carbon deposit it was necessary to shut down the plant each week while a piston was being taken out. The engine represented an investment of $30,000 and had been chosen in preference to a steam turbine because of the poor condensing facilities. Five gallons of fuel oil are used daily.

Modern Water Turbine Practice.

Dr. H. Zoelly, engineer with Escher, Wyss & Company, Zunich, Switzerland, described important installations of low head, medium head and high head Escher, Wyss turbines throughout the world. Special attention was given to the design and operation of the oil pressure governor.

Wheels of the Pressure Type.

Arnold Pfau, Milwaukee, Wis., after distinguishing mathematically between the impulse and reaction turbines, discussed the evolution and application of the latter type of water wheel with special reference to the Francis turbine. This was classified according to the runner speed, the position of the shaft, the setting, the number of runners employed and the method of controlling the flow. Full discussion was given of the conditions which govern the selection of type. Credit was given the Holyoke testing flume as being responsible for much of the advance in turbine practice. Brief treatment was also given of methods of gate valves, speed regulation and pressure control. The paper concluded with suggestions as to purchasing, testing and rating turbines.

Dr. Zoelly's and Mr. Pfau's papers were discussed together. J. D. Galloway in a contributed discussion, praised Mr. Pfau's paper as being one of the best contributions to the conference. However he questioned the limiting values of specific speed as defined by Mr. Pfau and cited cases of higher and lower values. He strongly confirmed the author's recommendation as to the necessity for more uniform definitions and suggested that a conference committee be appointed by the electrical, mechanical and civil engineering societies to formulate standard rules and definitions.

W. A. Doble, in discussing Dr. Zoelly's paper stated that it referred wholly to European practice, as many features mentioned had been in use in California for many years. He considered Mr. Pfau's paper of value to engineers interested in specifying hydraulic equipment. However, it was not written for wheel designers. Credit for the first successful governor should be given to Lombard. He stated that a low specific speed limitation was set by the size of the runners. Large runners do not pay, as an impulse wheel is better adapted for duty requiring very low specific speeds.

Hydraulic Power Development and Use.

J. D. Galloway, consulting engineer at San Francisco, set forth the general engineering features of hydraulic power development for the generation of electric energy. After a brief history of the development of the impulse wheel and the beginning of high tension transmission the author discussed American practice in the several details of construction of medium and high head plants. These include the storage reservoirs, diverting dam, water conduit, regulating reservoir, penstock, water wheels, generator and station equipment, giving tabulated data regarding important installations, together with illustrations of typical plants. Similar information is given for a number of low head plants. In conclusion the author stated that "in the United States, the only obstacle in the path of still greater development is the well defined policy, both state and national, to hamper all private initiative by restrictive legislation."

In discussing Mr. Galloway's paper Mr. Doble in a written discussion submitted proof in favor of lap-welded pipe for penstocks. He cited cases of high

frictional retardation due to the riveting and showed that for high head plants a smaller lap-welded pipe would suffice. He stated that 170 installations had been equipped with lap-welded pipe varying in diameter from 11 inches to 84 inches and having a total length of 366,917 feet. He questioned Mr. Galloway's recommendations of concrete piers, showing that the danger of expansion and contraction stresses was lessened when the pipe was embedded in the earth. He also stated that reversible water motors were superior to hydraulic cylinders as gate valves. The relative merits of Francis and Pelton wheels depend upon the character of installation. The Francis turbine is not suitable where grit and silt occur in the water and the question of initial efficiency is not as important as that of maintained efficiency. He showed that horizontal shaft turbines are best for small units and the vertical shaft for large units.

G. H. Marx voiced emphatic protest of the author's ascribing restrictive legislation as the cause of the lack of water power development in the United States.

Canadian Hydraulic Power Development.

Charles H. Mitchell, consulting engineer to Dominion Water Power Branch, Canadian Department of the Interior, reviewed progress and discussed features of design for water storage, turbines, pipe lines, and dams. Special attention is devoted to ice problems.

In discussing Mr. Mitchell's paper, Mr. Doble stated that the maintained efficiency of turbines was affected by the character of design and by the character of the water. Low specific speed runners have a slight tendency to cut and are seriously eroded by grit and silt, causing the turbine to fall off in efficiency because of leakage.

Water Wheels of the Impulse Type.

W. A. Doble, chief engineer Pelton Water Wheel Company, divided the development of the impulse wheel into the "mining period" from 1850 to 1890, and the "electrical period" from 1890 to date, showing how the severe requirements of the latter had been met by the manufacturer. He then treated successively of the design and construction of wheel runners and buckets of double-lug and chain-type nozzle and systems of control (including needle regulation, deflectors and relief control) governors, (standard, vertical and direct-operated), main shafts and bearings, wheel housings, control gates and baffle plates. Each of these were illustrated by descriptions and pictures of typical installations.

In discussing Mr. Doble's paper L. E. McCoy of Juneau, Alaska, inquired whether tests had been made of the relative efficiency of single nozzle and two nozzle wheels. Mr. Doble replied that there was very little difference in efficiency between the two.

The Boiler of 1915.

Arthur D. Pratt of the Babcock & Wilcox Company, New York. traced recent refinement in the design of boilers with special attention to the use of high pressure steam standardization by legislation and the use of economizers. Increased efficiency and greater capacities have resulted from improvement in furnace form so as to give more economical consumption and in automatic fuel feed. The use of steel boiler casings has also been an important factor in increasing efficiency as steel preserves its insulating qualities longer than brick settings and prevents air leakage. These several factors have also made it possible to place a boiler on the line more quickly, to handle greater load fluctuations and to carry continuous high overloads. While most of the paper was confined to coal fired boilers due consideration was also given to oil, wood refuse, bagasse and gaseous fuels. The record for capacity with oil firing has been an evaporation of 18.7 lb. per sq. ft. of heating surface from and at 212 degrees with an efficiency of 78 per cent. A summary was also presented separate theoretical investigation of heat transfer in boilers.

Marine Steam Turbine.

Lieutenant Commander H. C. Dinger, U. S. N., Washington, D. C., briefly traced the development of the steam turbine during the past twenty years with particular reference to its application to marine propulsion. The relative advantages of reaction and impulse turbines was discussed. There has been a tendency to use impulse blading for the high pressure end and reaction blading for the low pressure end of the expansion as well as a tendency for all makers to adopt certain standards of design and construction. Electric drive, hydraulic transmission and reduction gearing were discussed as means for adapting the high speed turbine to the slow running propeller so as to obtain the greatest efficiency of each.

Marine Steam Turbines.

J. F. Metten, chief engineer Fm. Cramp & Sons' Ship & Engine Building Co., gave an outline of the several methods of applying steam turbines for marine propulsion, together with suggestions as to the class of work for which each method seems best adapted. Coupling turbines direct to propeller shafting combines the advantages of simplicity, economy, reliability and minimum weight for vessels operating at 21 knots and over. Mechanical reduction gears are suitable for cargo boats because of fuel economy and smaller cost of maintenance and operation as well as less weight as compared with reciprocating engines. Turbo-electric transmissions give economy at reduced speeds. Hydraulic transmitters are complex and have lower efficiency than mechanical gears. Their chief advantage are in their maneuvering qualities.

The paper by Lt. Commander Dinger and J. F. Metten were read in conjunction. With reference to the former Tatsuo Furnichi objected to the statement that a geared transmission saves weight over a direct electric drive and with reference to the latter, he referred to the simplicity of connection in favor of electric drive.

W. J. Davis pointed out that both authors had overlooked the excellent maneuvering qualities of electric drive, where the control of the switch is made simple and positive through switches.

Fred Williams, Meitz & Weiss, San Francisco, emphasized the fact that electric drive is fool proof, occupies less engine room and requires less piping to the turbines and condensers.

Diesel Engines for Marine Propulsion.

G. C. Davidson, Groton, Conn., after reviewing reasons for slow progress in application of Diesel engines to marine propulsion, discussed the relative merits of two-cycle and four-cycle engines, preferring the latter. Light weight engines have found favor for use in submarines while the heavier engines are good for naval and commercial work where fuel economy, increased radius of action and increased cargo capacity are needed. The Diesel engine uses ½ lb. of fuel per shaft h.p. hour, the steam engine 2 lb. The future should see a less number of types and a greater number of engines in use.

C. Kloos, technical director of "Werkspoor," Amsterdam, confined his treatment to mercantile ships, describing the results of a large number of typical installations. "Balancing the good and bad qualities of motor and steam ships, the fuel price in the parts of the world where the ship has to run will generally decide to which side the balance will incline."

IRRIGATION.

Irrigation Enterprise in the United States.

C. E. Grunsky of San Francisco, after tracing the past developments which have brought about the present water laws, many of which are inadequate, discusses how irrigation projects are being constructed by owners of land to be irrigated, private irrigation companies, under the Desert Land Act, under the Carey Act, the U. S. Reclamation Act, and the irrigation district law. He recommends that the individual states should adopt the same policy as the United States employs to encourage development under the Reclamation Act, particularly with regard to extending financial aid. Examples of foreign practice are cited in support of his argument.

Distribution Systems, Methods and Appliances in Irrigation.

J. S. Dennis, H. B. Muchleston and R. S. Stockton of Calgary, Alberta, Canada, discussed the essentials of a successful irrigation project under the headings of sufficient water supply, good construction, and proper use of the water. The design of an irrigation system is considered under the heads of main and secondary canals, distributing ditches and farm ditches. The treatment is general, as is also that of construction, maintenance engineering and management. The paper concludes with an appeal for more attention to the human element, "for the most important part of the distribution system is the farmer who is to use it."

Irrigation in Lybia.

Professor Luigi Luiggi of Rome tells how the Italian government has rehabilitated its colony on the north coast of Africa by irrigation and other public works. Brief details are given of irrigation methods from wells and reservoirs. Most of the new reservoirs are of the rock-fill type provided with automatic syphon spillways. The future of Lybia depends upon the development of agriculture by scientific irrigation, as the Romans did nearly 2000 years ago.

Italian Irrigation.

Prof. Luigi Luiggi of the Royal University of Rome attributed much of the success of the Italian nation to irrigation and presented the result of Italian experience for application to American needs. Details of many dams and canals. Great ingenuity is displayed in the method of applying the water so as to get the best crop results. Because of several financial failures of irrigation projects and in order to prevent emigration a government subsidy of 3, 2 and 1 per cent per year is paid for the first, second and third 10 year periods, respectively. Further subsidies are granted for impounding reservoirs and for low prices, though in the latter case the works revert to the state after sixty years of a $30,000 annual subsidy.

Irrigation from Underground Water.

G. E. P. Smith, irrigation engineer, University of Arizona, Tucson, presented a brief survey of present practice in irrigation from wells. He emphasized the fact that ground water supplies are not inexhaustible and care must be exercised to secure maximum use of ground water reservoirs without serious permanent lowering of the water plane. Details were presented of methods of drilling wells and advice given on the selection of pumps, centrifugal pumps being preferred. The costs of electric and gasoline engine pumping were compared and figures given of the lift limitations.

Irrigation in India.

M. Nethersole, inspector general of irrigation in India, emphasized the importance of irrigation of areas with limited rainfall by means of canals from rivers draining the Himalayas and the Ghato mountains. Although India's irrigation systems rank among the largest in the world, only one-fifth of her agricultural lands are irrigated, an area of about 41,000,000 acres. Of this, 42 per cent is from government canals, 25 per cent from wells and the remainder from private canals, tanks and other sources. The most notable system is the Triple Canal Project for which the Jhelum River supplies water for nearly six million acres in the Punjab district. Surplus water from the Jhelum is transferred by over 1500 miles of flume to be utilized in the valleys of the Chenab and Ravi Cost details of headworks and flumes were presented in the paper. Technical details were also given of the Upper Suat Canal (including 11,235 ft. of channel) and the Bari Doab Canal including power from a hydroelectric plant for combined irrigation and drainage of sub soil.

Dams.

Arthur P. Davis, chief engineer U. S. Reclamation Service, and D. C. Henny, consulting engineer at Portland, Ore., reviewed recent departures from previous practice in the design, materials and methods of construction of masonry, earthen and rock fill dams. The danger of sliding has been overcome by curving the dam up stream. Uplift pressures are reduced by increasing the density of masonry near the water face and by drainage as well as by the use of an impervious apron. The arch principle has also been used to resist horizontal pressure in narrow canyons, independent spillways being provided. The multiple arched type obviated dependence upon concrete-imbedded steel with its uncertainty of life. Various forms of movable dams completed the section on masonry dams. Improvements in earth dams have included the use of puddled gravel, sand and clay core, grouting, piping under foundations to obviate over-topping and the use of the hydraulic method of filling. Many examples of different types were cited.

Earthen Dams.

Wm. L. Strange, late chief engineer in Sina, India, after discussing the general principles of earthen dam construction, took up methods of overcoming percolation and of draining dams. Special attention was devoted to practice in India with particular reference to methods of overcoming various difficulties. The waste-weir and the outlet were treated in detail.

Irrigation in Australia.

Elwood Mead, chairman State Rivers and Water Supply Commission, Melbourne, described methods employed and results obtained in distributing water for irrigation in Australia, where small and irregular waterfall make irrigation necessary. The Murray River and its tributaries irrigate 390,000 acres in Victoria, New South Wales and South Australia, of which 315,000 acres are in Victoria. Works now under construction will more than double the total area. The commission has introduced a system of rotation in water deliveries and water measurement, finally adopting the Dethridge rotating meter after experiencing trouble from tampering with other devices.

Irrigation in Spain.

J. C. Stevens, consulting engineer at Portland, Ore., presented two papers on this subject, one dealing with distribution systems, methods and appliances, the other with regulations controlling the use of water, metering water for irrigation and methods of charging. Spanish distributing systems are more complicated than American, owing to smaller sub-divisions of land and the fact that all lands are leveled or terraced before cultivation. The main canals are usually built by one organization and the distribution system by another. Detailed descriptions were given of the Urgel and Aragon systems. Permanency of construction characterizes all installations, no wood being used. All flumes are built of cut stone or concrete. The Urgel canal is operated by a private company under concession from the government and has practically no regulation nor measurement of water, in marked contrast to the government-operated Aragon system, where water is sold by quantity and the farmer pays for what he consumes.

Irrigation in Argentina.

C. Waulters, president of the National Society of Engineers of Argentina, showed that the present condition of

irrigation in Argentina is somewhat chatotic because of variable systems in the treatment of water and local legal customs. Many abuses have arisen under the system of irrigation by private enterprise. High irrigation allowances, careless regulation of water flow, and lack of public control are characteristic of this as well as other South American countries.

Duty of Water in Irrigation.

Samuel Fortier, Washington, D. C., discussed the various phases which determine the duty of water in irrigation, which "usually expresses the relation between a given quantity of water and the area of land which it serves." Those agencies and methods which place restrictions on the quantity of water which can be used in irrigation include state laws and control, court decisions and water right contracts, examples of each being cited. The factors causing variation in duty are fully discussed and tabulated results are given of water duty for various purposes in all the western states. The mean water requirement of different plants is also stated, together with argument for the more economical use of water.

Drainage as a Correlative of Irrigation.

C. G. Elliott of Washington, D. C., discussed the oversaturation of irrigated land, pointing out the loss from swamping and methods of obviating damage. Over a million acres of irrigated lands in the West have been made too wet for profitable cultivation or have been ruined by alkali. Intercepting drains and relief wells are suggested as a remedy, this being necessarily provided after the effects of irrigation have been observed, it not being possible to predict waterlogging.

Economic Advisability of Irrigation.

F. H. Newell, formerly head of the U. S. Reclamation Service, gave answer to the question "Does irrigation pay?" He pointed out the present condition of irrigation development, indicated economic reasons why irrigation has and should be practiced, the causes which have lead to the present condition of delay and some of the lines along which further progress may be expected. He demonstrated the economic advisability of irrigation and the need of a firmer basis for financing.

MISCELLANEOUS.

Preservative Treatment of Timber.

Howard F. Weiss and Clyde H. Teesdale, respectively director and engineer in charge of wood preservation at Madison Forest Products Laboratory, reviewed the results obtained in the United States in preserving wood. There are now nearly 100 plants treating over 150,000 cu. ft. of timber annually 80 per cent of which is used for cross ties, 7¾ per cent for construction timber, 5.3 per cent for piling, 4.6 per cent for paving blocks and the remainder for poles, miscellaneous and cross arms. Of this 70 per cent is treated with creosote, 24 per cent with zinc chloride and most of the rest with a combination of them. Details of these processes were given.

Steel Making in The Electric Furnace.

James H. Gray, mining engineer U. S. Steel Corporation, explained that the clean heat of the electric furnace made possible the production of steel free from all objectionable elements, including oxygen and sulphur. The electric steel made in the 150 furnaces that have been installed (no unit being larger than 20 tons capacity) is equal in every way to crucible steel. It lends itself more readily to heat treatment and is admirably adapted as a finishing process.

Railroad Electrification.

E. H. McHenry, New Haven, Connecticut, reviewed the development of electric motive power in the operation of light surface railways and steam railroads, where its application to tunnel lines, terminals, switching yards and long distance traffic were historically discussed. Its several advantages and limitations were pointed out and the trend of future development indicated. The paper concluded with a consideration of economic conditions of application.

Electric Motive Power in the Operation of Railroads.

William Hood, chief engineer Southern Pacific Company, demonstrated the general infeasibility of electrifying steam railroads except under especially favorable traffic conditions. This is primarily due to the power load factor imposed by operating necessities and because of the present uncertainty of tenure for hydroelectric plants on forest reserves.

The Mechanical Problem of the Electric Locomotive.

G. M. Eaton, engineer railway division Westinghouse Electric & Manufacturing Company, analyzed the static stress conditions whereby traction effort is transmitted from the motors to the driving wheels in three types of electric locomotives.

In addition to the foregoing, five sessions were held by the section on municipal engineering. These comprised discussions on city planning, transit problems, water supply, sewage, streets, highways, pavements, utilities, fire protection and bridges.

The section on railway engineering, in addition to electrification as heretofore reported, considered the the status of the railways of North and South America, Italy, India, China, Russia and the Netherland East Indies. The location of new lines, tunnels, track and roadbed, construction methods and equipment and bridges were also discussed, besides recent locomotive developments, rolling stock, floating equipment and railroad terminals.

Under the subject of materials of engineering construction, attention was given to structural timber in the United States, Canada, India and Russia, clay products, concrete, iron, copper, alloys, aluminum and the testing of materials.

In the mechanical engineering section founding, forging and machine shop equipment and methods occupied the first sessions, due attention also being given to safety engineering, industrial management and motor vehicles in addition to prime movers as detailed elsewhere.

Valuation and finance were the chief subjects in the mining engineering sessions, with brief reference also to organization, governmental regulation and mine inspection. The metallurgy of steel, copper, gold, silver, zinc and lead were treated in great detail. A symposium was also held in the utilization of fuels in metallurgy.

Naval architecture and marine engineering was the subject of seven full sessions which were concerned with the design and construction of cargo steamers for all classes of services under varying conditions, warships, submarines, driving mechanism, cargo handling methods and appliances at terminals and dock practice.

Other subjects of a miscellaneous nature included aviation, refrigeration, agricultural engineering, engineering education, scientific management, heating and ventilation.

CHART FOR GRAPHIC DETERMINATION OF FLOW OF WATE

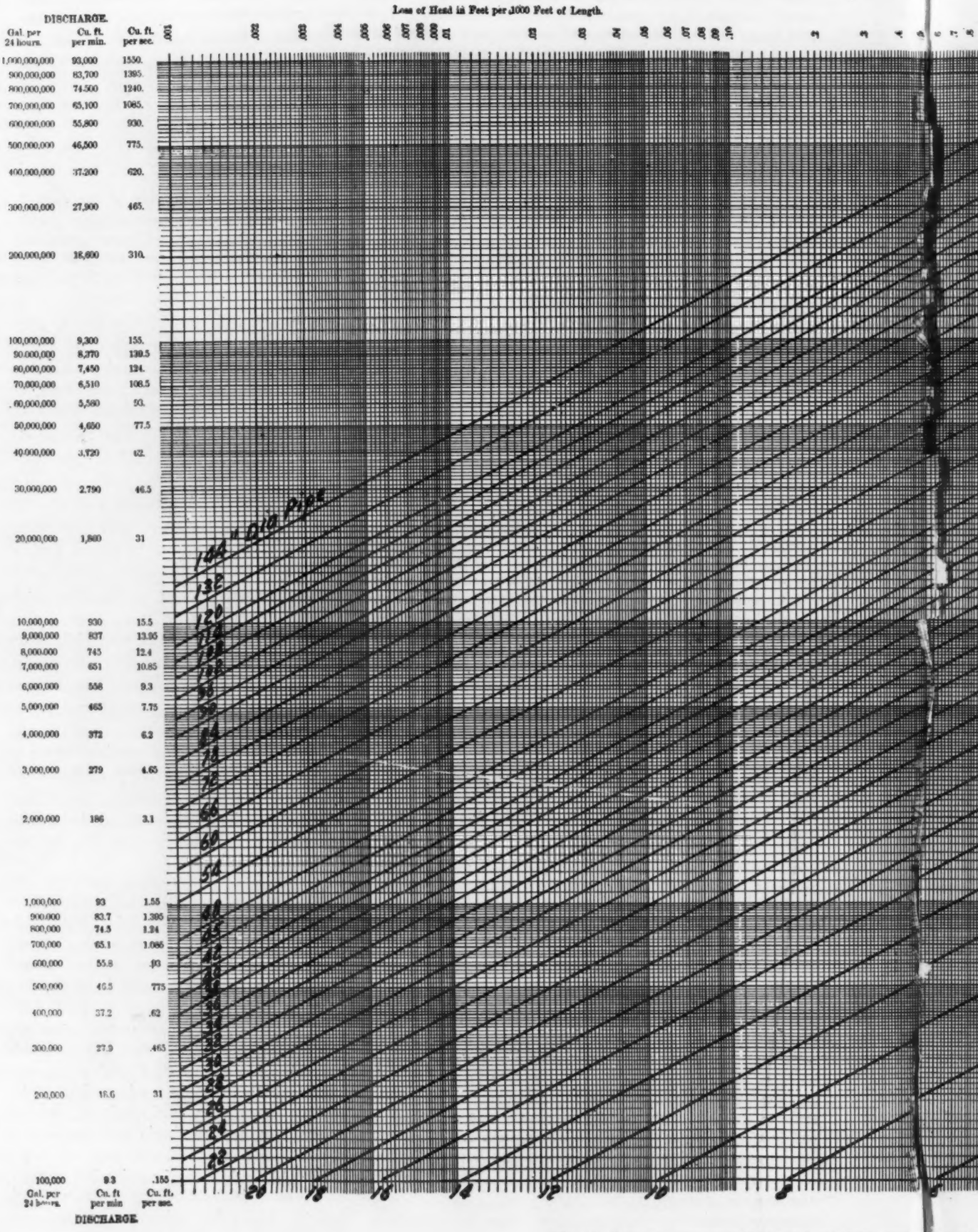
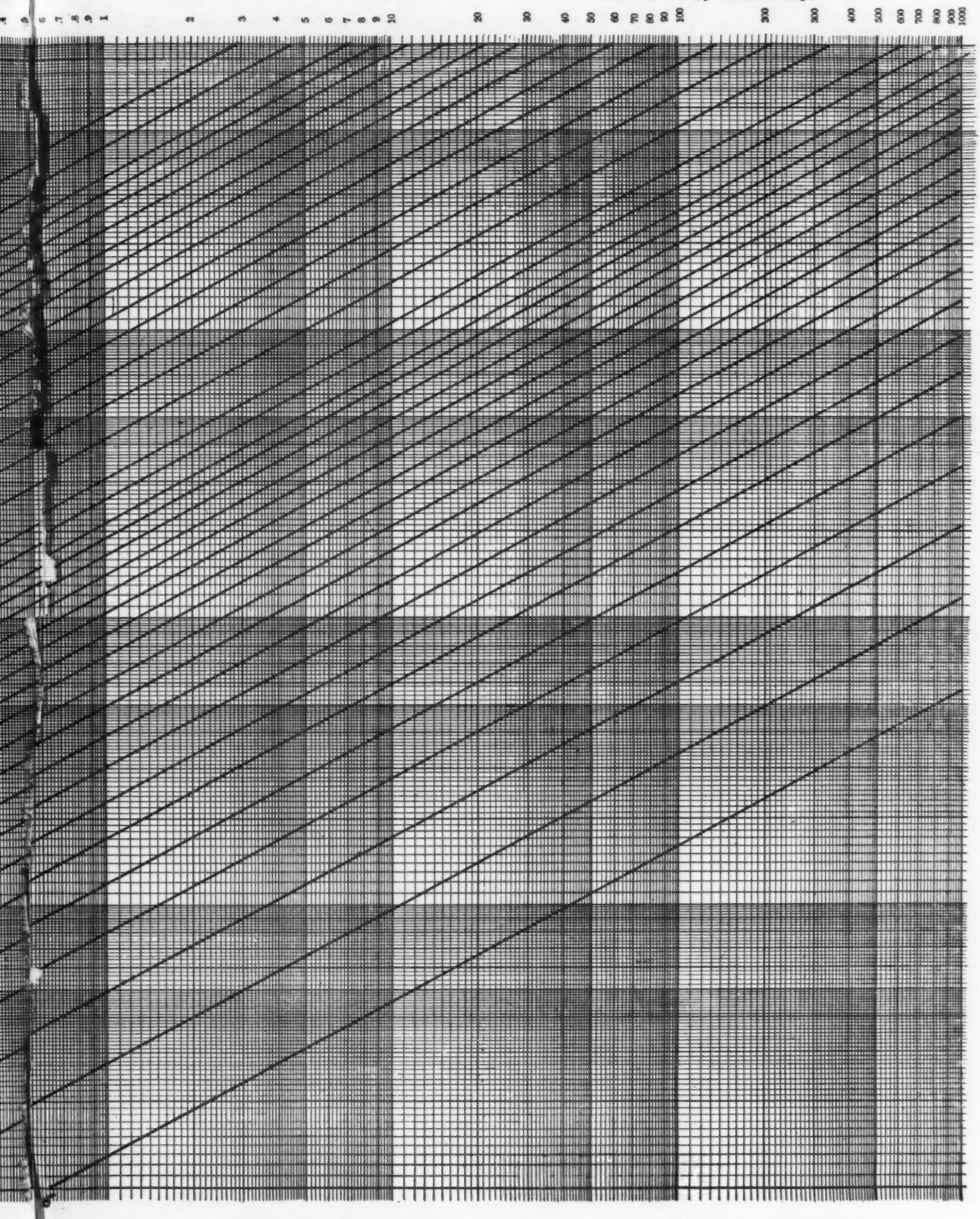


Fig. 43, C = 140, corresponding with straight smoo new pip

OF WATER IN PIPES BY HAZEN & WILLIAMS FORMULA. PREPARED BY GEO. J. HENRY.

Loss of Head in Feet per 1000 Feet of Length.



mod ew pipe surfaces as cast iron or lapwelded steel.

WESTERN STATES WATER POWER CONFERENCE

The Western States Water Power Conference convened for a three days' session at Portland, Oregon, shortly after 10 o'clock September 21, when it was called to order by Governor Withycombe of Oregon.

In his address of welcome Governor Withycombe pointed out the parallel between the present effort of thirteen Western states for the liberty of controlling their own resources and the fight for liberty of the thirteen original colonies. He spoke also of the evils of the government's attempt to override the rights of the individual states by assuming sovereign powers to build up within each of the public-land states a distinct and separate province of supreme authority. He presented the names of Governor William Spry of Utah as temporary chairman and C. C. Chapman of Portland temporary secretary, these men later being chosen to their respective positions in the permanent organization.

After other details of organization had been perfected Governor Lister of Washington in replying to the address of welcome urged that a spirit of compromise prevail during the sessions. While various committees were formulating their reports Clyde C. Dawson of Denver read the first formal address of the session, an abstract of which follows:

Developed Water Power—Ideal Conservation.

As a representative citizen of Colorado, Clyde C. Dawson considered the federal attitude as to water power development unwise, unauthorized by law, and not for the upbuilding of the states having undeveloped power sites or for the best interests of the country or the people as a whole. He asserted that the Ferris Bill would but aggravate present conditions by giving a semblance of legislative authority for doing that which has been brought about by administrative usurpation and the perversion of existing laws.

He argued that the full scope of the scheme for controlling natural resources on the public domain, of which water power is but one phase, would lead to the substitution of a servile tenantry for an independent citizenship of owners. He showed that while the legal title to the public domain rests in the United States, it is simply held in trust with the ultimate object that it shall be transferred to the people who will develop it. Water, however, is under the control of the respective states, and is not conserved by withdrawing and reserving from use.

He summarized the chief objections to the Ferris Bill, stating that the existing acts of Congress, properly construed, permit the development of water power under the control and regulation of the proper laws.

Upon reassembling after noon the reports of the committee on credentials, permanent organization and order of business were adopted, the latter recommending that the program of addresses be continued without discussion until completed. The first address of this session was given by Clay Tallman, Commissioner of the General Land Office, and the personal representative of Secretary Lane.

Attitude of Department of the Interior.

Mr. Tallman stated that if the conference had been called to protest against the principles of the Ferris Bill, he was not in accord with its purposes, but if intended to change the bill he would be glad to consider all that might be said that Secretary Lane thoroughly understood the situation and believes that no power rights should be granted in perpetuity. "Any law should specify a certain, fixed definite period, during which power may be used," he said, "and it should be long enough to enable the user to make the legitimate profit he is entitled to and long enough for any issue of commercial bonds that may be necessary to finance the development."

He insisted that at the end of this period the government should have the right "to take back this valuable franchise and privilege—not as a gift, but to take back at a reasonable valuation to be placed on it, so this valuable right shall not pass out of the control of the people.

"I believe the revenue from the lease should be little more than nominal, so as to give the user every opportunity to develop his right. The state should have a portion, and a fair portion, of that revenue—so far as I am concerned I would rather the state had all of it.

"The purpose of the charge is control, and to make such an income as will enable the federal government for the period of the franchise to reimburse the state for the taxes lost to it. These are the underlying principles of the Ferris Bill.

Samuel H. Piles of Seattle, ex-United States Senator, in replying to those statements, said:

The question before this conference is not whether a few people want to take from the government any water power site on the public lands, but whether the states have the right to control the water powers that they indisputably own, and whether they shall have the right to enter and appropriate government land to develop these water powers.

He likened the effects of the operation of the Ferris Bill to the blight that has fallen upon Alaska under federal guardianship and control.

"The federal control of the Ferris Bill is but the opening wedge. Little by little an opening here, little by little an opening there, until finally the people would be dependent on the will of Congress—a doctrine under which no free people can exist."

The next speaker was Henry S. Graves, chief forester of the United States.

"The great and fundamental question is the continued ownership and control by the public of the power sites it now owns," was the burden of his message. "A little while ago it was contended that the public had no right to regulate railroads, that it was the beginning of anarchy even to suggest that they did not have the right to use them as they pleased. Today no one questions the absolute right of the public to regulate railroads.

"A little while ago the men who built street railways were contending that the corporations which furnish capital should own the ground on which the tracks rested. Today no one dreams of allowing private ownership of city streets. The day of uncontrolled perpetual grants, or even the 99-year franchise not only for street railways but also for light and power companies, telephone lines and kindred public service enterprises, is past, never to return.

"Water powers are now passing through a similar period of controversy to a similar conclusion, as I firmly believe."

He was followed by O. C. Merrill, chief engineer of the Forestry Bureau, who declared that the West, despite its asserted grievances against governmental interference, has water power development far beyond its needs.

Western Power Resources Overdeveloped.

He argued that there is four and one-half times as much water power development in the Western states as in the Atlantic states in proportion to population.

Furthermore, such stagnation of power development as exists is due not to restrictive laws but to lack of markets for additional power, the speaker claimed.

"Of the 1,800,000 horsepower of developed water power in the United States, 50 per cent is in plants constructed in whole or in part on the national forests and operated under permit from the Departmeent of Agriculture," he said. "In addition, some 200,000 horsepower are in process of construction, and over 1,000,000 horsepower more are under permit for future construction. If we add the plants which are occupying public land outside of the national forests we should find that considerably more than one-half of the developed water power of the Western states is being operated on the public lands under permit from the federal government.

"Nor is this merely past history which recent conditions are changing. The Pacific Light & Power Corporation recently completed in California two power plants with an aggregate installation of 94,000 horsepower, as the initial step in ultimate development of 250,000 horsepower, all of which will be on national forest land, and is now under permit. The Great Western Power Company in the same state has permits for development aggregating 300,000 horsepower, on the Feather River and is making development as fast as the additional power can be disposed of.

The Nevada-California Power Company has four plants in operation on the National forest, will complete a fifth this season, and will begin a sixth next year.

"The Portland Railway, Light & Power Company is operating a plant on the Oregon forest and has permits for 40,000 horsepower more, which it proposes to develop as soon as use can be found for the power. Power sites of nearly 100,000 horsepower on the Baker and Skagit Rivers in Washington are under permit to the Puget Sound Traction, Light & Power Company to be developed when the existing surplus is disposed of.

"In order to support the argument against governmental control of water power sites on the public lands, the statement is made again and again that, although there is urgent need for more power, its development is stagnant in the United States. Volumes of argument have been based on this unproved and unprovable assertion.

"It is loudly acclaimed that the Eastern states, unhampered in the development of their water powers by the incubus of public land ownership, have far outstripped the Western states, and the demand is made that the federal government relinquish its control over the power sites on its lands in order that development may proceed in the West as it has in the East under the stimulus of private ownership, or, in any event, under the wiser and, of course, more lenient administration of the several states.

"When we investigate, we find that the actual fact is quite the contrary. In rapidity of development and in extent of development in proportion to population, the Western states have accomplished more in 20 years than the Eastern states in 100 years.

"In the Western states—and by 'Western states' I mean the eleven states west of the Kansas boundary, the group which contains practically all of the remaining public land —the amount of power used in the generation of electricity by public utility corporation, street railway companies and municipalities has increased in the last ten years alone by 440 per cent, or more than twice as fast as in the remainder of the United States, or in that group of Eastern states which includes the New England, Middle Atlantic and South Atlantic states.

"In proportion to population, the amount of power which is used for these purposes is two and one-half times as much in the Western states as it is in the remainder of the United States, and twice as much as it is in the Eastern states.

"While the development of water power in Eastern states increased about 90 per cent in the last ten years, it increased five times as fast in the Western states, or 450 per cent, more than doubling each five years.

"The state of California had a reserve in excess of all demands of 400,000 horsepower. Of course, a certain amount of reserve for emergency and to anticipate extensions of market is necessary, but if we should allow for even a 50 per cent reserve there would still be left a surplus of 100,000 horsepower.

"It would be surprising indeed if under such circumstances there was any considerable activity in power development at the present time in California. The state of California needs more users, not more power.

"A similar situation exists in Oregon and Washington and other western states. New plants are not being built in this state because the output of existing plants cannot be sold.

"Tens of thousands of horsepower in the Puget Sound district and in eastern Washington are unused because even at the exceptionally low figure at which the power has been offered there are no takers.

"There is scarcely a power center of consequence in the Western states that is not today developed ahead of the available market. Owners of power plants are bending their efforts to dispose of the power they already have, rather than to develop new plants to remain unused."

The next speaker was John H. Roemer, who suggested the indeterminate franchise as a solution to the question.

Federal Water Power Franchises.

John H. Roemer, general counsel H. M. Byllesby Co., Chicago, emphasized the need for action rather than talk. He showed that as the market which must be created for the power is dependent upon an assumed permanency of use, a temporary power permit is not sufficient, suggesting an indeterminate franchise, with an assumed term of at least fifty years. Furthermore, an administrative officer subject to political change should not be given great discretionary power. He also urged that in the event of ultimate public ownership the government should pay the fair value of the property as a going concern, less any values that have resulted from the public grant. He demonstrated the inadequacy of the Ferris Bill in meeting these requirements, concluding with the statement: "The belief that any law that Congress may enact will be eagerly accepted by the water power owners and the investors upon whom they are dependent for the means of developing, is a delusion."

The evening session was addressed by J. C. Ralston, consulting engineer at Spokane, who in a characteristically epigramatic manner, reviewed the history of the development of the Nation's resources by the policy of federal encouragement of private initiative.

Relative to National Development.

He urged that the statesmanship of the past may well be the guide to the future in framing water power legislation.

"We also see," he continued, "that water power legislation must be substantive and not subjunctive; permissive, not restrictive; that it must be responsive to and sympathetic with the principles of encouragement, not discouragement; that it must be free from the petty entanglements of departmental formulae, legal uncertainties and short-term grants, devoid of socialistic and unfair escheatments, and, finally, inviting to the financial, industrial and engineering genius of the land."

The Wednesday morning session was addressed by United States Senators George E. Chamberlain of Oregon, Thomas J. Walsh of Montana and Reed Smoot of Utah.

Senator Chamberlain, the first speaker, assailed Governor Withycombe on having, as he said, appointed men opposed to the Ferris Bill on the Oregon delegation. He also attacked

the Portland Chamber of Commerce for its bulletin discussing the purposes of the conference.

He said the delegates should try to refute the arguments presented in the paper of O. C. Merrill, "instead of indulging in crimination and recrimination of the Forestry Service." He stated that there is no interference in the Ferris Bill with the rights of the state. The states own non-navigable streams, but the government owns the land along the streams —one as necessary as the other. Shall the government give up its valuable rights on these lands and lose its last chance to control the development of water power?

He thought what the conference ought to do is to endeavor to formulate some policy for adoption. Resolutions of denunciation won't do any good.

Senator Walsh, who followed Senator Chamberlain, spoke along much the same lines.

He declared the idea that under a leasing system power sites on federal land could not be taxed was erroneous.

"Government lands, aren't subject to taxation, of course," he said, "but whenever the government gives a possessable right to anyone, that lease-hold right is subject to taxation anywhere. It has been so decided by the United States Supreme Court, and not only that, but we already do it in Montana. We tax even the right of the land holder on public lands to occupy his right."

He asserted that if the idea of the conference is to denounce the Ferris Bill, the delegates might as well go home without debate. "Do you think that the Secretary of the Interior will be influenced in his version of the law by resolutions you may adopt?" he asked.

"The question is whether you are going to grant the privilege of occupying power sites for all time, or whether you are going to adopt the same policy as you adopt with public utility franchises. Eastern opinion, you must remember, too, is all one way. The Easterners might be disposed to agree to what the unanimous opinion of the West demanded, but when we are so divided among ourselves, what can we expect?

"With Republicans as well as Democrats in the West raising their voices against any effort to convey these power sites in perpetuity, I wonder how much chance any measure to that effect has of being passed. And what influence will any resolutions to that end adopted by this conference have?

"I sincerely hope that even at this late date we shall direct our attention to the wisdom of this policy, modifying it so far as we can in accord with the ideas prevalent in this part of the country."

Senator Smoot, before proceeding with his set address, refuted Senator Chamberlain's accusations regarding the appointment of biased delegates by telling of the invitations that had been extended to those who have favored the Ferris Bill. Abstract of his address follows:

Federal Tax on Water Powers.

Reed Smoot, U. S. Senator from Utah, thought that it is only by an amendment to the constitution that the several states can be deprived of their right to regulate and control the appropriation and use of water for all purposes excepting navigation. He demonstrated that even the alleged incapacity of Western States to care for their resources would be sufficient cause for the destruction of the fundamental plan of our national government.

Conceding the benificent intention of the Ferris Bill he showed the dire effects which would follow from its enactment. He brought out the fact that uncertain tenure, arbitrary control, burdensome taxes and prospective confiscation are no inducement to capital to invest. He told of the benefits which would accrue from the development of hydroelectric power and how these could not be obtained by taxing it out of existence.

In conclusion Senator Smoot quoted many authorities as to the danger of too great a centralization of government.

In concluding Senator Smoot said that there was no thought of secession in appealing for the right of state control of water power.

In the afternoon John H. Finney, member of the Water Power Committee of the American Institute of Electrical Engineers, presented the committee's statement:

A. I. E. E. Water Power Committee Statement.

John H. Finney presented a statement from the Water Power Committee of the American Institute of Electrical Engineers, which showed that since 1909 hydroelectric development has been greatly retarded by inadequate federal laws, which do not afford stability of tenure and impose burdens and grave hazards of loss. The committee's original statement to the U. S. National Waterways Commission in 1911 was repeated and additional emphasis was laid upon the necessity for stability, security and fairness and good faith if private capital is to be attracted.

Attention was called to the fact that with the reduction in the cost of steam power, the total water power of the country susceptible of profitable commercial development continually shrinks. It was shown that the prosperity of the country will be increased by the development of water power and that present regulations are a bar to confidence in hydroelectric properties.

In addition to this report Mr. Finney proposed that a commission be created by Congress consisting of the Secretaries of the Interior, War and Agriculture for the purpose of granting permits for water power enterprises only to such companies and persons as may have obtained a charter from state authority.

The duties of such a commission should be few and minor, he said, such as the fixing of a reasonable rental for use of land and assuring safe construction of buildings. He would leave to the state the rest of the duty of regulation, covering all the larger features, such as tenure and water power tax. The further provisions of Mr. Finney's plans are:

"The aforesaid state charter to contain specific provisions as to use; as to oversight of financing; as to regulation of rates and charges at the hands of a state commission; as to the rights of recapture by the state for a public use on a fair and equitable basis at the end of an agreed period, whether that be fifty years or more; as to the rights of the grantee if recapture is not effected; together with such other safeguards as may be wisely bargained for between the state and its created agency of operation, in any given case.

"The federal commission thus having a responsible agency with which to deal, with its purposes named, its financial methods approved, its proper regulation assured, need then only be concerned to impose the minor restrictions which the general public interest demands. These are:

(a) The obtaining of a fair value of, or fair rental on, any governmental lands which the enterprise may require.

(b) Safeguards as to navigation, such as locks, storage of water, etc., on navigable streams.

(c) Supervision or approval of plans for proposed structures, dams, etc., as to the safety thereof, and

(d) The possible supervision or regulation of rates or reservation to regulate, when the project is engaged in interstate commerce."

Resolutions received by telegraph from the American Mining Congress, protesting against the principles of government leasing, were read by Secretary C. C. Chapman and loudly applauded.

S. Z. Mitchell of New York, utility banker, spoke from the investors' standpoint, particularly to tell why investors fear such legislation as that contained in the Ferris Bill.

The Investor's Standpoint.

Capital is not so much concerned as to whether it is regulated by state or national authority, but does object to a double regulation. Federal tax does not matter if the investor is enabled to pass it on to the consumer.

Mr. Mitchell reviewed the difficulties under the present law, particularly as to departmental regulation. Regulation changes with the personnel of officials, and changes are made from time to time in the conditions that make the situation intolerable, and make investors fear to place money in such enterprises.

Under the Ferris Bill, the Secretary of the Interior is still continued in a position to place onerous restrictions on business, because only a few things are specified, and the secretary is given authority to make other rules not inconsistent with the terms of the act. In 50 years there have been 20 Secretaries of the Interior and numerous bureau chiefs, with various views.

Mr. Mitchell attacked the Ferris Bill provision for renewal of lease at the end of the primary term under such terms as the law may at that time stipulate. The proposed federal tax on water power is by no means so small a matter as some of the government officials have indicated, and in some cases is several times greater than the cost of steam development in the east.

The speaker said that while he has heard it asserted that some of the power interests are favorable to the Ferris Bill, he doubts if any of them now consider it safe or fair. But some such support might come, he thought, from those who possess a monopoly in certain districts, and desire to perpetuate that monopoly by allowing the law to remain as it is or to advocate as an alternative the Ferris Bill. He continued:

"People wonder why it is sought to single out and remove from the power business the protection which the constitution and general laws guarantee to every citizen in every other line of business and to all property of every kind and description wheresoever situated. Is it a part of the plan to keep a stranglehold upon them so that they may be, at the right time, acquired for much less than their real value? Is it with a view of keeping a choking grip upon them so that they may be divided into a class of good and bad corporations, as it may at the moment please the particular departmental head or bureau chief in Washington to classify them and thus enable him to arbitrarily control their destiny.

"Why do these people want such unparalleled power? What good purpose can be served by replacing the old form of government of law by a species of government by one man, whose decisions depend upon his discretion, which may be arbitrary, but in any event are final? They are not subject to review by courts or any other body. Bear in mind that this one all-powerful official is not elected by the people. He can dictate rules and so-called regulations which are laws within themselves and which will permit Western communities to develop their resources under normal conditions or the reverse, but the people must bow to his iron will. Did any pro-consul of the Roman empire ever have more taxing or governing power than is asserted in the departmental rules and regulations of the past ten years, and which arbitrary power can be continued under the authorized rules and regulations in the secretary's discretion under the Ferris Bill? Remember that the power to levy a discriminatory tax is the power to destroy."

At the Chamber of Commerce banquet on Wednesday evening Henry J. Pierce of Seattle delivered an address as published in full elsewhere in these columns, illustrating his remarks by lantern slides and moving pictures. Informal speeches were also made by ex-Governor James H. Hawley of Idaho, Representatives Albert Johnson and William E. Humphrey of Washington and Julius Kahn of California.

On Thursday morning the first speaker was Senator Clarence D. Clark of Wyoming, who declared that the Federal Government had a distinct duty in developing the latent resources of the great West.

He contrasted the actual duty of the government as he sees it with the record of past performances as the West has experienced them, pointed out that instead of aiding in the development of these Western resources, the federal government actually has stood in the way of development.

In his direct discussion of the Ferris Bill Senator Clark called attention to those provisions which give "at least tacit assent to the view that congress or the executive department of the federal government has a superior power over the waters of our streams than has the state.

"If the government of the United States has authority over the streams of the intermountain region and the West for power purposes, it will be but a short step until the same claim will be made as to its power for irrigation, domestic and other purposes; for such is the irresistible ambition to seize power and to exercise authority that the best men when placed in position are prone to exercise that ambition to the fullest extent.

"The prime purpose, as I look upon it, of the Ferris Bill and of similar legislation started along other lines, is the centralization of power in the executive departments of this government."

The last set speech of the conference before considering the report of the committee on resolutions was delivered by Frank H. Short of California.

Constitutional Aspects of the Ferris Bill.

Frank H. Short of Fresno, Cal., after pointing out the evils which have arisen from non-adherence to a constitution in Mexico, San Domingo, Haiti and China, argued that the Ferris Bill represented an evasion of the constitutional rights of the states in that it discriminates against particular interests and deprives certain states of powers of government granted to other states. It violates the rights of public land states and attempts to impose restrictions and limitations upon the development of the resources of these states, which the United States could not pretend to do in a state having no public land, and where no other property owner could assert similar power.

The unconstitutional provisions of the Ferris Bill include the 50 year limitation of the period during which a right of way may be used, the discriminatory power given the Secretary of the Interior, and federal assumption of the state's right of eminent domain.

He furthermore showed that the imposition of rentals varying inversely with the cost of development would not encourage development. It is contrary to the decisions of the Supreme Court to regulate rates and service in states without a public service commission.

He also showed that such policies predicated upon the need for guardianship were no longer popular, and he demonstrated the inconsistency of the claim that the "remaining resources of the nation belong to all the people of the nation, and are to be held, operated and used for the benefit of all the people."

"The constitutional powers of the federal government, regardless of public lands or other proprietary interests, is ample for all purposes. There is no necessity, there is no

justice, there is no excuse, for the attempted exercise of non-constitutional unrepresentation, arbitrary power and discrimination in connection with the public lands."

Two sets of resolutions were introduced by the committee appointed by that purpose. The majority report, as submitted by Senator Reed Smoot of Utah, chairman of the committee, was adopted by majority vote of the conference. The text of the resolutions follows:

Text of Resolutions Adopted by Western States' Waterpower Conference.

Whereas, The new states admitted into the Union are of necessity upon an equal footing in all respects whatever with the original states; and

Whereas, Each state has full jurisdiction over all lands within its borders, including the beds of streams and other waters; and

Whereas, The ownership by the federal government of the technical title to vacant public land within a state does not confer upon the federal government any greater or other governmental powers than it possesses within the original states; and,

Whereas, The long established and sound policy of the United States with respect to the disposition of its unappropriated public lands is opposed to the making of a direct revenue therefrom, beyond the expense incident to the surveying, classification and disposing of such lands, but, on the contrary, that said policy is intended to encourage and promote the settlement and development thereof; and that any act of congress, or any administrative interpretation thereof, which is not in harmony with this policy, does an injustice to the new states by placing them on an unequal footing with the original states, and by discouraging and preventing the settlement of such new states and the development of their resources; and.

Whereas, The vacant land belonging the federal government constitutes two-thirds of the area of the states represented in this conference, and amounts to more than twice the area of the thirteen original states; and

Whereas, The vacant lands belonging to the federal government are under the law exempt from taxation, while the burden of maintaining local government over their entire area rests upon the states; and

Whereas, The maintenance inviolate of the constitutional equality of the states of the Union is essential to that balance of power on which the perfection and endurance of our political fabric depend, and to the harmonious operation of the scheme upon which the Republic was organized; now, therefore, be it

Resolved, That we are unalterably opposed to any legislation which is in conflict with the fundamental principles above declared.

Resolved, That the states have the constitutional right and power to control and regulate the appropriation and use of the waters within their boundaries for all beneficial purposes except navigation, and also the right and power to control and regulate the rates and service of their public utilities.

Resolved, That we are opposed to any policy that looks toward imposing the system of leasing generally upon the public domain for the reason that such system is contrary to the spirit of our free institutions, and would retard the development of the resources of the states in which there is still any public land.

Resolved, That in view of what we believe to be administrative misconstruction of existing legislation, we are in favor of a declaratory act by congress recognizing and acknowledging that the proprietary interest of the United States in the vacant land within the states is subject to the jurisdiction and eminent domain of those states for all uses which are declared by the laws of those states to be public uses and which are so essential to the development, well-being, and prosperity of those states.

Resolved, That the purposes of encouraging the development and utilization of the natural resources of the country by private enterprise which actuated congress in the enactment of the right-of-way acts of July 26, 1866, and March 3, 1891, and in the enactment of the acts of March 3, 1877, and June 4, 1897, making all non-navigable waters on public lands, including forest reservations, free for appropriation for beneficial uses, should actuate congress today in the enactment of any further legislation upon those subjects.

Resolved, That any legislation by congress, the purpose or effect of which is to substitute arbitrary or discretionary authority of executive officials for the fixed rules of law governing the administration, sale or other disposition of public lands and reservation and rights-of-way over the same will be unwise and inconsistent with the spirit or our constitution.

Resolved, That we are opposed to ownership or control either direct or indirect by the United States government of intrastate public utilities.

On this resolution the delegates voted as follows:

Howard S. Reed of Phoenix.....Aye
A. E. Chandler of San Francisco.....No
George E. West of Durango.....Aye
A. P. Ardourel of Boulder.....Aye
Clyde C. Dawson of Denver.....Aye
Thomas Tonge of Denver.....Aye
David R. Elliott of Denver.....Aye
W. F. R. Mills of Denver.....Aye
Governor Moses Alexander.....Absent
James H. Hawley of Boise.....Aye
John W. Hart of Menan.....Aye
Fred W. Berger of Berger.....Aye
I. E. Rockwell of Bellevue.....Aye
Dr. J. B. Morris of Lewiston.....Aye
J. S. Randall.....Aye
T. J. Walsh, United States Senator of Helena.....No
J. B. Collins of Miles City.....Aye
Sam D. Goza of Helena.....No
J. E. Erickson of Kalispell.....No
George Lyon, Jr., of Nelson.....Aye
William M. Kearney of Carson.....No
D. V. Moore of Grand Forks.....Aye
John O. Hanchett of Harvey.....No
W. Lair Thompson of Lakeview.....Aye
S. B. Houston of Portland.....Aye
Governor Withycombe .....Absent
Edgar B. Piper of Portland.....Aye
W. B. Beers of Salt Lake City.....Aye
E. A. Wedgwood of Salt Lake City.....Aye
S. A. Bailey of Salt Lake City.....Aye
Governor William Spry, Salt Lake City.....Aye
United States Senator Reed Smoot.....Aye
Governor Ernest Lister.....Absent
Phil H. Adams of Ellensburg.....No
M. C. Harris of Hoquiam.....Aye
A. H. Imus of Kalama.....Aye
W. V. Wells of Anacortes.....Aye
Clarence D. Clark, United States Senator.....Aye

Result: 28 ayes, 7 noes. Absent 3.

A minority report, submitted by Thomas J. Walsh of Montana, endorsing the principles of the Ferris Bill, was defeated by the same vote after a spirited debate.

CONTRACTORS AND JOBBERS' MEET.

The regular monthly meeting of the California Electrical Contractors' Association was held Friday evening, September 24th at a down town cafe, San Francisco. Fifty-two members were present. C. L. Chamblin presided. In opening the meeting he said: "We are gathered here to study the problems that confront us in our business and we should come to these meetings with the idea of getting some good out of them. The modern tendency is now for co-operation; we should fall in line and do our part. It seems to me that a person who has not enough interest, not enough stick-to-itiveness to attend these meetings with regularity has not enough sticktoitiveness to make his business a success."

The subject of the evening was assigned to two speakers —Mr. Rudy Holderman, who was defending the side, "Why I am running an exclusive retail store," and L. R. Boynton, "Why I am running an exclusive electrical contracting business."

Both speakers in their papers brought out salient features showing the necessity of specialization but by reason of the peculiar condition under which each was operating neither paper could be taken as a criterion of how the business should be conducted, but on the other hand, both papers brought out some good points upon which a lively discussion followed.

Geo. R. Weber stated that in Oakland he did not think a man could run but one end of the business without the other and maintain it on a paying basis.

The chairman asked if it was the tendency for the contractor to get into the dealer end of the game.

W. Gribble thought that all are agreed that there are too many small business concerns in the electrical field. The only thing to do is to take hold of these small men and try to develop them into successful merchants. This is the only hope for a better condition wherever the field is oversaturated, namely to improve the standard of the business and develop those engaged in it along business lines.

W. L. Goodwin stated that the situation should be taken into consideration. Mr. Holderman is an electrical dealer located in the best retail section of San Francisco. How long would he have the opinion he has today if every electrical man here was to settle in his district and open up a retail store. "I do not take it that Mr. Holderman would recommend that every man when starting out take one line or the other. A man starting out must consider his location and the requirements of that location. The business will not justify specializing except in the largest centers and to just that extent I do agree with the papers. Our business is a combination business taken as a whole and only in the large cities can it be specialized.

"I will agree with Mr. Holderman that the margins of profit required in the conduct of a retail electrical store are quite different from the margins of profit required in the conduct of contracting business but I will not admit that we as a class are incapable of running retail electrical stores.

"While merchandising costs may not be analyzed by the average small dealer, the information is so readily accessible that any small dealer can obtain accurate and reliable information as to the cost of merchandising any particular article. If, therefore, he is unable to to determine this for himself, does not prove that he would be incapable of conducting a business and determining the profits necessary to the success of the business."

W. L. Berry stated that Mr. Holderman made a good point, i.e. where a man does attempt to run both businesses he wants to buy what he thinks the customers want and in doing this he is very liable to over buy. "This we find is hurting credit to many contractor dealers. I believe that outside of the large centers the contractor must be with us. The contractors lose money through buying materials likely to become obsolete."

W. D. Kohlwey said there were many things he would not buy if he could not install them. If he were selling a range he would like to install it and he would not run the business and would not take the interest in it if he could not do the installing end of it.

S. V. Walton made report on the various heating appliance papers at the meeting of the Northwest Electric Light & Power meeting at Portland. He urged closer co-operation with the architects and the placing of greater sales effort back of domestic appliance articles. Speaking in a broad sense he said that while electricity in the home had reached a wonderful state of development, yet he believed it was only in the experimental stage.

M. S. Orrick presented a paper on "Why We Should Support the Legitimate Jobber."

Secretary Hanbridge reported that the association had taken in fifteen districts of the Pacific Gas & Electric Company since the last meeting and suggested that the various contractors get in touch with the district manager in his particular district and enlist his interest in the dealer-contractor work.

Attention was called to the opportunities offered dealers-contractors by W. L. Goodwin, through the sale of electric ranges and impressed upon them the advantage of getting in on the national wide range campaign soon to be launched in this country. Notice was given of the lecture to be delivered by Mr. J. A. Britton on his trip through the Orient, at the Oakland Auditorium, October 13th.

WIRING COMMITTEE MEETING.

A meeting of the wiring committee of the Commercial Section of the National Electric Light Association was held on Friday, September 17th, at the headquarters in New York City.

On the question of the standardization of plugs and receptacles, a report was presented from Mr. Benjamin, representing the manufacturers of the angle-pull type and Mr. Sargent, representing the manufacturers of the straight-pull type, and other information was presented to the committee which will be submitted to the manufacturers of both types before being further published.

On the question of bare concentric wire, several members reported on installations already made in their cities, using standard American fittings, and Mr. Sargent, of the General Electric Company, reported that in accordance with the request of the committee, the General Electric Company was going ahead with the preparation of special fittings and possibly a few special tools and hoped to have these ready by the middle of November.

It is the opinion of the committee that as soon as these fittings are ready, a large number of additional installations will be made with the permission and for the information of the Underwriters and other inspectors.

On the question of the solid neutral, it was reported that the Sprague Company is getting out a bulletin showing panel boards designed for the use of solid neutrals without fuses or switches on the grounded wires, either the grounded neutral or the grounded side of the two-wire circuits, which would result in a distinct reduction in the cost of large installations as well as being in accordance with the new safety rules.

It was recommended that the various members of the committee take steps in their various cities to have this principle recognized and approved by the local inspectors.

Circular 54 of the Bureau of Standards had been referred to the committee by the National Electric Light Association for report and a number of recommendations in regard to the same were drawn up which will be submitted to the representatives of the National Electric Light Association who are to appear before the Bureau of Standards at a conference on October 27th.

JOURNAL OF ELECTRICITY
POWER AND GAS

FOUNDED 1887

PUBLISHED WEEKLY BY THE

Technical Publishing Company

Crossley Building, San Francisco

E. B. STRONG, President and General Manager
A. H. HALLORAN, V. P. and Managing Editor
A. M. HUNT, Treasurer and Special Contributor
C. L. CORY, Secretary and Special Contributor
ROBT. SIBLEY, Director and Special Contributor

CHICAGO OFFICE: 537 SOUTH DEARBORN ST.
JOSEPH H. EVERSTON, Advertising Representative

ON LIBRARY CARS OF ALL SOUTHERN PACIFIC TRAINS

TERMS OF SUBSCRIPTION.

United States, Cuba and Mexico	per year,	$2.50
Dominion of Canada	" "	3.50
Other Foreign Countries within the Postal Union	" "	5.00
Single Copies, Current Month	each,	.25

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Change of advertising copy should reach this office ten days in advance of date of issue. New advertisements will be accepted up to noon of Monday dated Saturday of the same week. Where proof is to be returned for approval, Eastern advertisers should mail copy at least thirty days in advance of date of issue.

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The International Engineering Congress

Now that the International Engineering Congress has passed into history, opportunity is afforded for retrospection. That its main objects were so admirably accomplished was due primarily to the indefatigable efforts and indomitable courage of the committee of management headed by Prof. W. F. Durand of Stanford University. Without question the printed record of its papers and discussions will represent the most comprehensive of modern engineering achievement ever compiled.

This record, or such portions of it as may be of particular interest, will be available to every member, present and prospective. But to the thousand members who registered their attendance there is the additional pleasure of friendships renewed and acquaintances formed.

Furthermore every one in attendance gained a fuller understanding of the relation subsisting between his own specialty and all the other diversified branches of engineering. The congress demonstrated that there is increased dependence with increased specialization, that engineers can co-operate with one another to their mutual advantage. Engineering thus typifies the natural law that its place on the scale of progress is measured by the degree of specialization. This congress, also was successful in teaching the engineer the danger of working too much alone for it brought a realization of the necessity of all specialists working for the general advancement of the whole. With this consciousness of power the engineer should be an even more potent agent in promoting the civilization of the future.

The prevailing sentiment among those fortunate enough to attend the meeting was perhaps most fittingly expressed by J. R. Villalon, the delegate from Cuba, when he feelingly said "yesterday we met, today we part, what was a pleasure is now a regret." The memories of past pleasant associations carry with them the hope of their future renewal.

Confusing the Water Power Issue

From the hydroelectric standpoint, the results of the Western States Water Power Conference at Portland last week were negative. Water power became merely a side issue in a general condemnation of the federal conservation policy. The main issue was obscured in the opposition to all legislation having to do with leasing unappropriated public lands.

Those who are anxious to develop our latent and wasting water resources have no business in a quarrel with the federal government's policy of handling timber and mineral lands. The ostensible purpose of the meeting was lost sight of in a futile and foolish effort to stem the tide of popular opinion which has been aroused on this subject.

The Forest Service officials apparently had intended to attend this meeting in a spirit of compromise. They conceded the need for legislation and were anxious to learn the ideas of Western hydroelectric people. They admitted the right of the several states to control unappropriated waters. The original con-

tention of Gifford Pinchot that the control of the land carried with it the control of the water appertaining thereto is no longer countenanced by some of the leading officials of the Department of the Interior.

Hence it is evident that an attempt has been made to use the power controversy as a catspaw to pull out the chestnuts of other interests. And to that extent this meeting is a disappointment to those who are working for an opportunity to develop the great water powers of the West.

Secretary Lane recognizes the fact that the water power of the West cannot be developed under the present law as was indicated by his statement before the Senate committee on public lands last December:

> It is generally conceded that the water power resources upon the public domain can not be developed under existing laws, because of the uncertain tenure involved by revocable permits; (a) because the engineer and the promoter fear to embark an enterprise under such conditions; (b) because the capitalist will not loan money upon such security; (c) because the consumers can have no positive assurance that they will be supplied for a fixed and definite period.
>
> It is an established fact that numerous responsible persons who have obtained permits to develop power sites under the existing law have been unable to construct because of the foregoing.

He realizes the need for a law which will give to the developer and investor an assured tenure for a period long enough to justify his investment and reward his efforts. But, like many of the power men themselves, he has an exalted idea of the value of the land as a dam site, reservoir site or for other purposes having to do with water power development. He stated that for these purposes "the larger and more valuable sites are worth millions of dollars."

This fundamental misconception is the basis for the exorbitant charges which have been proposed. He argues that as the developers would seldom be willing to pay such a purchase price, but might be willing to pay a rental of say five per cent of such a valuation, the National Government is justified in making such a charge.

Perhaps the best way to gain the right idea regarding this matter is to imagine a site in every way adapted for storing and utilizing water for power purposes except that it has no water. Such land in an arid and rocky region is not even worth a dollar and a quarter an acre. Its prospective value lies solely in the presence of abundant water. Furthermore its real value resides in the availability of capital to erect the necessary restraining works and to create a market for the power to be produced.

It is believed that many electrical men are laboring under the same misapprehension as is the Secretary of the Interior when they ascribe the value of their property to the land occupied and not to the water utilized.

Such points as this received little or no consideration at the Portland conference. Much of the discussion was of a destructive, or rather an obstructive, nature. Constructive criticism, with a few notable exceptions, was conspicuous by its absence. John H. Roemer did suggest the desirability of an indeterminate permit. S. Z. Mitchell offered some constructive financial advice and John H. Finney made a number of practical suggestions. But most of the speakers confined their remarks to denouncing what has been done in the past, without proposing what should be done in the future.

This is a situation which requires deeds, not words, action, not talk. And to this extent the conference was a failure as far as working out a solution for the present lamentable state of affairs is concerned.

The Curve of Progress

One somewhat surprising feature of the International Engineering Congress was the attempt of several engineers to define the limitations of engineering progress. They apparently believed in their ability to write the last chapter in the book of human advancement from the trend of the plot in the first chapter. This tendency to forecast the future upon the records of the past was exemplified in Frank G. Baum's paper on "The Effect of Hydroelectric Power Transmission Upon Economic and Social Conditions," in the concluding paragraph of which he stated:

> When * * * the energy we require comes from water power and waste fuel resources, we will have reached the age of the wise, of "our inheritance." The curve of human efficiency must become flattened and become asymptotic to the line representing 100 per cent, and as this 100 per cent line is known, and we are approaching it with the electric system, I believe the electrical age to be the ideal end of the remarkable series of steps of human progress that has taken place in the past 100 years.

A number of other speakers, in commenting upon the efficient performance of prime movers, apparently had a similar thought in view.

However satisfying such a feeling of engineering-complacency may be, it does not seem to have taken into account the possibilities of utilizing other forms of energy. In experiments with radium the physical chemist has come perilously near to the secret of unlocking the tremendous store of inter-atomic energy which is everywhere awaiting the possibility of application to man's material needs. The time may not be far distant when the high frequency of the sun's light vibrations can be efficiently transformed to the lower frequencies of heat and electricity. Of course it is not thought that either of these probabilities will in any way disturb the stability of investments in hydroelectric power plants for many years to come, but they are merely suggested as problems still meriting the attention of the engineer.

Bold, indeed, is he who attempts to define the limitations of progress. Like the man defining the impossible he is interrupted by its accomplishment. Is it not more likely that the short arc of the curve of human progress to which we are momentarily tangent is not a parabola approaching its asymptotes but a logarithmic spiral of ever increasing radius?

PERSONALS

J. Case, manager of the Los Angeles office of the General Electric Company, is at San Francisco.

G. C. Green, manager of the Fairbanks-Morse Co., San Francisco, is on an Eastern business trip.

Geo. Baldwin, electrical dealer of Klamath Falls, was a visitor at San Francisco during the week.

H. S. G. Hurlburt, superintendent of the Pacific Power Company, Bodie, Cal., is at San Francisco.

F. N. McAvoy, manager of the Reno Electric Works, spent a few days at San Francisco during the week.

H. R. Trainer, manager of the Boston branch of the H. W. Johns-Manville Company, is a visitor at San Francisco.

D. J. Des Camp of the Seattle office of the Western Electric Company, was a visitor at San Francisco during the week.

A. Bunnell, president of the Lassen Lighting Company, Susanville, Cal., was a visitor at San Francisco during the week.

Robert Johnston, manager of the San Francisco sign department of the Federal Sign System (Electric) is at Santa Cruz.

E. C. Andrews of the Los Angeles office of the Western Electric Company, spent a few days at San Francisco last week.

Geo. Plummer, manager of the Yerington Electric Company,. Yerington, Nev., was a visitor at San Francisco the past week.

E. E. Hudson, vice-president and division manager Thos. A. Edison, Inc., primary battery department, Bloomfield, N. J., is at San Francisco.

W. S. Greenfield, manager H. W. Johns-Manfields Company, San Francisco, is on a business trip through the Sacramento Valley, Cal.

I. W. Simpson, Western district manager of the Federal Sign System (Electric), visited Stockton, Modesto, Turlock and Fresno during the past week.

Geo. A. Hughes, inventor of the Hughes electric range, addressed the Oakland Rotary Club last week on the subject of "Cooking With Electricity."

F. H. Leggett, manager Western Electric Company, San Francisco, is expected back the last of the week from a trip to Seattle and the Northwest territory.

E. W. Rockafellow, general sales manager Western Electric Company, New York, is a recent arrival at San Francisco on a tour of the Pacific Coast cities.

H. V. Carter, president of the Pacific States Electric Company, San Francisco, returned the first of the week after a several weeks' trip throughout the East.

C. A. B. Halvorson, Jr., chief engineer of the lighting department General Electric Company, Schenectady, N. Y., returned to Schenectady the first part of the week.

A. P. Tills has resigned as contract agent of the Oregon Power Company at Eugene, Oregon, to become the Northwestern representative of the Federal Sign System (Electric).

Dr. Thos. Addison, Pacific Coast manager of the General Electric Company, is one of the passengers on the special train to the American Electric Railway Convention at San Francisco next week.

W. H. McLaren, manager of the General Electric Company's electrical home at the Exposition, was the guest and speaker at the September 25th meeting of the Alameda Country Electrical Development League.

H. D. Rothwell, assistant engineer Hydroelectric Power Commission of Ontario, is inspecting the lines and substations of the Pacific Power & Light Company in the Yakima Valley. He will visit Seattle in returning to Toronto.

Frank Stone, formerly of the appliance department of the General Electric Company, San Francisco, has become associated with the Pacific States Electric Company, San Francisco, where he will handle the heating appliance line.

Geo. W. Shaver, engineer connected with the service department Westinghouse Electric & Manufacturing Company, San Francisco, has resigned from that company to accept a position with the Ogden, Logan & Idaho Railway with headquarters at Ogden, Utah.

E. J. Kingsley, Southwestern representative of the Federal Sign System (Electric) who has been conducting an electric sign campaign in co-operation with the San Diego Consolidated Gas & Electric Company, visited Los Angeles and Santa Barbara last week.

F. W. Hild has resigned as general manager of the Portland Railway, Light & Power Company, to become vice-president and general manager of the Denver Tramway Company, and will leave within the next few weeks for Denver to take up his new duties. Mr. Hild has been with the Portland company since March 1911, prior to which he was assistant manager of the Havana Electric Railway Company of Cuba for four years. He has always taken an active interest in improving the relations between the public service company and the utility. Mr. Hild, it is understood, was induced to take the position in Denver upon the urgent appeals of C. M. Clark, chairman of the board of the Portland Railway, and a director of the Denver Tramway Company.

MEETING NOTICES.

International Gas Congress.

The International Gas Congress convened at San Francisco September 28th to October 2d. Nearly five hundred gas men from all parts of the country were in attendance.

At the opening session of the Pacific Coast Gas Association on Monday the following officers were elected for the ensuing year. President, Frank A. Cressey, Jr., of Fresno; Vice-President, C. B. Babcock, San Francisco; Secretary-Treasurer, Henry Bostwick, San Francisco; Directors, John A. Britton, San Francisco; R. H. Ballard, Los Angeles; Samuel Kahn, Stockton; A. B. Day, Los Angeles; H. R. Basford, San Francisco; S. W. Coleman, San Francisco; S. C. Bratton, Portland. Santa Barbara was selected as the next meeting place.

An adjourned meeting of the Illinois Gas Association was held Monday afternoon, President R. B. Harper presiding and giving a brief address.

Routine business was transacted at the annual meeting of the American Gas Institute on Tuesday afternoon, President E. C. Jones presiding. The following officials were elected: President, W. E. McKay, Boston; Vice-President, Hermann Russell, Rochester, N. Y.; Jacob D. von Maur, St. Louis; Arthur H. Elliott, Flushing; Charles O. Bond, Philadelphia, and John B. Crowley, St. Paul. Geo. G. Ramsdell was re-elected secretary-treasurer.

During the week the following papers were read and discussed:

"The Development of Water Gas," O. B. Evans.

"Deep Fuel Combustion as Applied in Water Gas Manufacture," Arthur G. Glasgow.

"The Substitution of Heating Value for Candlepower as a Standard for Gas Quality," R. S. McBride.

Symposium on "Illumination," consisting of six papers, arranged by C. O. Bond.

Symposium, "Commercial Aspects of the Gas Business," National Commercial Gas Association, under the direction of C. Willing Hare.

"Modern Coal Gas Processes," the Society of Gas Engineering of New York.

Symposium, "A Review of the Present Practices in the Manufacture and Distribution of Gas by British Undertakings," a contribution from the Institution of Gas Engineers of Great Britain through the late Edward Allen, engineer of the Liverpool Gas Company, consisting of an introduction and five papers.

An elaborate program of entertainment had also been provided and was greatly enjoyed by all participating.

Electrical Development and Jovian League.

The Wednesday, September 22, meeting of the league was held at the Palace Hotel, San Francisco, President Geo. C. Holberton presiding. Routine matters of business were disposed of, after which the meeting was turned over to Mr. Fred Wilson of the Standard Underground Cable Company, as chairman of the day. After some very delightful vocal and instrumental music, Mr. Ralph Pope, honorary secretary of the American Institute of Electrical Engineers, was introduced as speaker of the day. Mr. Pope gave some very interesting remarks on the early days of engineering on the Pacific Coast. A vote of thanks was tendered the speaker and the chairman of the day, after which the meeting adjourned at 1:30 P. M.

CIVIL SERVICE EXAMINATION FOR JUNIOR ELECTRICAL ENGINEER.

The United States Civil Service Commission announces Commerce Commission organization of junior electrical engineer, Grade I, $1200 to $1680 a year, and Grade II, $720 to $1080 a year. Competitors will be examined in theory and practice of railway electrical engineering as applied to electric traction power generation and transmission, lighting and motor drive, and the mathematics used in this branch of engineering, including algebra, geometry and trigonometry, but not including calculus (50 points); education, training and experience (50 points).

TRADE NOTES.

The Westinghouse Electric & Manufacturing Company announces the more important among the large number of awards received at the Panama-Pacific International Exposition: The Grand Prize, the highest possible award, on the 4000 h.p., 650 volt, d.c. double-unit Pennsylvania electric locomotive mounted on a turntable under the dome of the Transportation Palace. The medal of honor on alternating current and direct current industrial and control apparatus, on precision instruments, on Le Blanc condensers, on motor-generator sets for moving picture machines and on high voltage oil switches. The gold medal on a number of different classes of apparatus among which are steam turbines, alternating and direct current generators, alternating current and direct current railway motors, transformers, rectifiers, starting, lighting and ignition systems, switchboards and accessories and mining locomotives. A number of silver medals and bronze medals were also received. The company was also awarded the gold medal for the most complete and attractive installation in the Palace of Transportation.

The Panama-Pacific International Exposition officials have set aside October 21, 1915, as "Edison Day," and it would appear possible that the new U. S. Government Advisory Board of which Mr. Edison is chairman, may come out in a body and be at San Francisco Edison Day.

A local parade committee has been appointed, with E. M. Cutting as chairman, to arrange for floats made up of early Edison inventions, and later commercial developments of same, including the phonograph, dictating machine, storage and primary batteries, incandescent lamps, moving picture machines and films, etc. The executive committee consists of John A. Britton, Guy L. Bayley, W. D'A. Ryan and Dr. Thomas Addison.

THE AMERICAN ELECTRIC RAILWAY ASSOCIATION CONVENTION.

The thirty-fourth annual convention of the American Electric Railway Association and its five affiliated associations, which will be held in San Francisco, October 4 to 8, will be of unusual importance to the industry that it represents. The program includes 22 addresses and papers, 80 reports of committees, and a number of written discussions.

Many men distinguished in public life or by their achievements in the field of electric transportation will speak before the convention. Governor Hiram W. Johnson of California will deliver the address of welcome. Ex-Senator Jonathan Bourne, Jr., of Oregon, will speak on "The Evils of Government Ownership." "Welfare Work" will be the subject of Jesse W. Lilienthal's address; he is president of the United Railroads of San Francisco, a lawyer of eminence and a director in many corporations that have played an important part in the upbuilding of the Pacific Coast. He has become famous throughout America as a philanthropist of high ideals and great practical achievement.

Bion J. Arnold will discuss "The Foundation Principles of the Valuation of Electric Railways." No one is better qualified to speak authoritatively on such a subject, which is one of the most pressing questions of the day.

Among the many committee reports, that concerning the operation of motor vehicles and summarizing the investigations regarding the "jitney" situation will be of especial interest. Another report of a committee of the American Association, that on the Cost of Passenger Transportation Service, is also noteworthy, including as it does the results of the exhaustive studies which the Bureau of Fare Research has been making for the last year.

P. V. Burington, secretary, Columbus (Ohio) Railway, Power and Light Company, will present before the Accountants' Association a paper on "Electric Railway Accounting—A Review," and Professor Carl C. Plehn of the University of California will speak on "The Taxation of Electric Railways."

The Engineering Association's Committees on Power Distribution and Way Matters will present reports of unusual value. The report of the Committee on Heavy Electric Traction, and the joint report of the Engineering and Transportation and Traffic Associations' committee on Block Signals will be thorough and comprehensive.

In the meetings of the Claims Association the subjects of the principal papers will be: "The Prevention of Motor Vehicle Accidents," by S. B. Hare, Altoona, Pa.; "Standardization of Claims Statistics," by E. E. Slick, Anderson, Ind.; "A Card Index and What It Means," by J. J. Reynolds, Boston, Mass.; "Safety and Its Relation to Conservation," by B. F. Boynton, Portland, Ore.

The Transportation and Traffic Association's Committee on Construction of Schedules and Time Tables, and that on Fares and Transfers, will render reports that, in their conclusions, represent distinct advances along the lines concerned. A notable address before this association will be "The Relation of Electric Railways to Agriculture," by Paul Shoup, president, Pacific Electric Railway Company, Los Angeles, Cal.

PUBLICATIONS RECEIVED.

Bulletin 94, U. S. Bureau of Mines, "U. S. Mining Statutes Annotated," by J. W. Thompson, 1772 pp., 6x9 in., comprises a codification and annotation of all Congressional enactments relating to minerals, mineral lands and mining, including water rights. Price, $2.50.

Bulletin 75, U. S. Bureau of Mines, "Rules and Regulations of Metal Mines," by W. R. Ingalls, James Douglas, J. R. Finlay, J. Park Channing and John Hays Hammond; recommendation for laws to be passed by mining states, together with explanatory notes, including electrical installation; 296 pp., 6x9 in. Price, $0.35.

NEWS NOTES

FINANCIAL.

LOS ANGELES, CAL.—The circulation of petitions for calling an election on a bond issue of $1,550,000 to extend the city water mains in Hollywood, Palms and west side districts of the city, is now in progress. H. T. Wright, secretary of the Hollywood board of trade, is in charge of the work.

TWIN FALLS, IDAHO.—E. B. Critchlow of Salt Lake City, vice-president of the Twin Falls Waterworks Company, has rejected the offer of the city to pay $60,000 in bonds for the company's waterworks system. The matter will be taken up before the public utilities commission, and a price fixed for the system, and if this is refused, a certificate of necessity will be issued to the city by the commission, and the council can go ahead with the installation of a new system.

INCORPORATIONS.

MT. PLEASANT, UTAH.—The Home Telephone Company has been incorporated here.

ALBUQUERQUE, N. M.—The City Electric Company of Albuquerque has been incorporated at Albuquerque. Capitalized at $250,000. Incorporators are Geo. Roslington, Lloyd E. Sturges and E. L. Groze. Company authorized to run railroad system, also to operate trackless vehicles, and do general electric power business.

RIVERSIDE, CAL.—Incorporated, Colorado River Telephone Company. Principal place of business at Blythe. Capital stock, $25,000, and will maintain about 80 miles of lines for accommodation of settlers between Blythe and Blythe Junction. Directors are: Floyd Brown, R. E. Hopkins, S. D. Kamrar, James Rennie and E. F. Foulke.

ILLUMINATION.

HILO, HAWAII.—The Hilo Electric Company is to be allowed to install its meter system immediately.

SHELLEY, IDAHO.—Installation of an electric lighting system is under consideration by town trustees.

BELLINGHAM, WASH.—Mayor deMattos has vetoed the street lighting ordinances passed by the council August 30th.

EUGENE, ORE.—The council has ordered the installation of ornamental lighting posts on Ninth avenue from Olive to Pearl streets.

POCATELLO, IDAHO.—The council will ask electrical companies to submit bids for re-wiring and repairing the lighting system in the subway.

LOS ANGELES, CAL.—At a meeting of the city council it was proposed that the city construct power plants on Rush Creek and Leevining Creek.

SEATTLE, WASH.—A petition has been presented to the council for cluster lights at the head of stairs on W. Garfield street and Ninth avenue W.

BLACKFOOT, IDAHO.—F. V. Riley, civil engineer, Idaho Falls, proposes the construction of a lighting system here to be operated by a Diesel oil engine at a cost of $2300.

GREAT FALLS, MONT.—A resolution of intention for a special improvement lighting district for the erection and construction at an estimated cost of $8280 passed the council.

PASADENA, CAL.—The city commission has adopted a resolution of intention ordering the installation of posts, conduits, wires, etc., for ornamental lighting along Colorado street.

OROVILLE, CAL.—Negotiations for the purchase of the Oro Electric Corporation by the Great Western Power Company have been completed, and the announcement of the terms may be expected at any time.

SILVERTON, ORE.—At the last meeting of the city council an ordinance to bond the city for a sufficient sum to install a municipal electric light system was introduced and read for the first time.

PHOENIX, ARIZ.—Sealed bids are being received at the office of the city manager for supplying the city with not less than 25 nor more than 300 ornamental light standards, according to plans on file in the office of the city engineer.

PORTLAND, ORE.—Commissioner Baker of the department of public affairs, is contemplating installing a lighting system in several of the parks without illumination. In all probability the lights will be installed in Holliday and Sellwood parks.

LIVERMORE, CAL.—At the last meeting of the board of trustees, Geo. L. Fish, representative of the Union Gas Company of San Francisco, addressed the board on the matter of installing a municipal gas plant at Livermore. The matter was laid over for future consideration.

SAN FRANCISCO, CAL.—Work has been completed by the men of the Pacific Gas & Electric Company on laying a giant cable across the Golden Gate to the Marin shore. The cable will be completed for service in about six weeks, and will be used to bring power from the high Sierras to this city.

TRANSPORTATION.

LEWISTON, IDAHO.—A. G. Nortz, president of the Lewiston-Clarkston Transit Company, is visiting here, with a view to making extensions in both cities of the street railway system connecting Lewiston and Clarkston.

SAN JOSE, CAL.—The San Jose Railroads Company has made application to the supervisors for a franchise for a single or a double track, standard guage, electric railroad with necessary sidings, etc., over certain highway in Santa Clara County.

ORANGE, CAL.—Officials of the Pacific Electric Railway plan to construct a direct line from Orange to Garden Grove to connect at the latter point with the main line to Los Angeles. Engineers will go over the ground soon to survey for the new line.

KINGMAN, ARIZ.—The board of supervisors granted Dan Angius franchise to erect telephone poles along the highways, etc., of the county. The franchise covers the establishment of lines from Oatman, through Gold Road to Kingman, and also to Chloride by way of mining camps in Wallapai district.

LOS ANGELES, CAL.—Authority to construct more than 20 grade crossings and one undergrade crossing along Hawthorne cut-off between Watts and Redondo Beach, franchise for which has been granted by the city, is sought in a petition filed with the State Railroad Commissioners, by the Pacific Electric Company. The site of the undergrade crossing is at Western avenue. The date will be set for hearing.

LOS ANGELES, CAL.—The Pacific Electric Railway has been awarded the contract to change the harbor belt line railroad system from steam to electric motive power. There are six and a half miles of track in the harbor railroad system, owned by the city. The railway company, through Paul Shoup, its president, has agreed to do the work for cost of labor and material, plus 10 per cent for engineering and overhead charges.

SAN FRANCISCO, CAL.—Action ordering the construction of an extension of the Geary Street Municipal Railway across Golden Gate Park, from Tenth avenue and Fulton streets to Fourteenth avenue and Lincoln Way, and from thence to Judah street, has been passed to print by the board of Supervisors. At the same time the supervisors adopted

a resolution requesting that the park commission grant permission for the construction of the proposed extension of the municipal railway across Golden Gate Park.

CHICO, CAL.—Half a million dollars will be available for improvements to the Northern Electric Railway system as soon as the plan of reorganization is approved by the bondholders. The proposed plan has been gone over carefully and the main features that were found objectionable in previous schemes have been eliminated. It has been agreed to by all the creditors and provides for the deposit of securities or claims with the Union Trust Company, or the First Federal Trust Company, named as depositors. The agreement contains a provision for the payment of $500,000 by the Slosses, in return for which they receive a release of liability as endorsers of company notes. The first mortgage bondholders are to receive dollar for dollar upon their investment, but in consideration of the half million that is to be at once furnished for the rehabilitation of the road, they signify that their interest may be deferred and that no action will be instituted by any of them for a period of five years.

TELEGRAPH AND TELEPHONE.

ELLENSBURG, WASH.—The Ellensburg Telephone Company has petitioned the board of county commissioners to grant a franchise to construct and operate telephone lines along roads in Kittitas county.

EUGENE, ORE.—The Pacific Telephone & Telegraph Company has taken over the long distance line between Glenada on the south bank of the Siuslaw River, and Gardiner, near the coast, and will use it as a link of the line contemplated to operate between Eugene and Coos Bay.

LACERVILLE, CAL.—Grants for the right of way for a telephone line from the place of J. A. and Della Garney, near Shingle Springs, to S. Euer's place, west of Clarksville, have been awarded the Pacific Telephone & Telegraph Company. The line is to be about twelve miles in length.

FRESNO, CAL.—At this week's meeting of the city trustees the matter of renewing the 25-year franchise for the Pacific Telephone & Telegraph Company was laid aside and City Attorney Smith was instructed to draw a franchise and present it to the next meeting of the board. The old franchise expires on November 4th.

RICHMOND, CAL.—The council received plans from C. H. Moore, of the Pacific Telegraph & Telephone Company for an underground wire system to cost $25,000. It is planned to supplant aerial lines on Macdonald avenue, from Third to Nineteenth streets, with under the surface cable, but the work will not be started for some time.

SPOKANE, WASH.—A number of improvements will be made in the Home Telephone & Telegraph Company service. Thirty-five hundred and seventy dollars will be spent in the Glenwood district by replacing fifteen loop miles of exchange and suburban wire with 6000 ft. of aerial cable and placing new poles, cables, cross arms, etc.; $600 will be spent in the central office on improvements.

WATERWORKS.

BELLINGHAM, WASH.—The water board has voted to lay a 6 in. pipe in Flore street, between Prospect and North Commercial streets.

FRESNO, CAL.—On recommendation of Fire Chief Wintemute it has been ordered by the city trustees that nine additional fire hydrants be purchased.

LODI, CAL.—City Engineer Barzelotti has been asked to furnish an estimate of the cost of work necessary to put the water system in first class condition.

DEMING, N. M.—A. J. Haas, formerly of Riverside, Cal., has purchased S. J. Grumble's place five miles east of the city and will install three new pumping plants.

YUBA CITY, CAL.—The board of trustees of Yuba City have authorized the city clerk to advertise for bids for the installing of water meters throughout the town.

ESCONDIDO, CAL.—The Mutual Water Company will probably install an electrical filter system, according to a statement by James Byron, superintendent of the company.

SANDPOINT, IDAHO.—There is a growing sentiment in Sandpoint in favor of a municipally owned water plant. There is now a plan on foot to bond the city for $50,000 to pay for the purchase of the plant.

TONOPAH, NEV.—The county commissioners are receiving sealed bids for the erection, installation and completion of two redwood tanks of 250,000 gallons each capacity, to be 47 ft. 6 in. outside diameter and 20 ft. staves.

SEATTLE, WASH.—Bids are being received by the secretary of the board of public works, C. B. Bagley for the improvement of 50th Avenue Northeast by the construction of water mains therein, according to plans and specifications on file.

BAKER CITY, ORE.—The city council of Pine Valley has submitted a petition to the county court asking for permission to lay pipe from the United States forest reserve to Halfway, a distance of about three miles, along the side of the county road.

SACRAMENTO, CAL.—Specifications for the construction of a pipe chamber at the city pumping plant, Front and I streets, have been adopted by the city commission. They provide for a room 33x90 ft., connecting with all mains, leading from the waterworks. Bids will be received up to October 5th.

OAKDALE, CAL.—A special committee of the board of directors of the irrigation district has recommended that the contracts for pipe on some of the district's construction work be awarded to the Western Pipe & Steel Company of San Francisco. Its bid was $11,014, and its only near competitor, according to the committee, was the Sacramento Pipe Works, with a bid of $11,118.

PHOENIX, ARIZ.—The United States Department of the Interior has granted permission to promoters to make preliminary surveys for the proposed six dams that are to be built in Grand Canyon, also for sites of reservoirs and hydroelectric plants to be constructed. J. B. Girand, city engineer of Phoenix, will have charge of surveys. The first dam will be located in Diamond Canyon, north of Peach Springs, will develop 50,000 h.p. The six hydroelectric plants will have a capacity of 400,000 horsepower.

LOS ANGELES, CAL.—The public service commission has made public details of its purposes with reference to proposed issue of bonds in Hollywood, Colegrove and Palm districts for the extension of the city's water systems. Proposed issues will aggregate $1,550,000 and will cover not only the purchase of the private system of the Union Hollywood Water Company, but also proposed extensions, enlargements, etc., Santa Monica Boulevard main, replacing of pipe, etc., construction of Cahuenga Pass trunk line, Franklin avenue tunnel, by way of Ventura road to Franklin avenue, and others. It is probable that a bond election shall be called early this fall.

POCATELLO, IDAHO.—The city council has decided to construct a municipal water system with a capacity aiming to provide for a population of 25,000. The plans and report of the hydraulic engineer, E. S. Anderson, were accepted. The plans contemplate the utilizing of the Bastiste springs, four miles northwest of the city, which are the source of supply for the Oregon Short Line Company's system. A pumping station is to be installed and a reservoir with a capacity of 4,000,000 gallons will be constructed on the west bench. A 20-inch steel main will connect the springs with the reservoir. Within the city the system will include 26 miles of pipes. Engineer Anderson says the water system may be built for $400,000, the amount voted last year to establish a municipal water works.

ALPHABETICAL INDEX TO ADVERTISERS

The letter and number before each name are used in the classified page following

A-1 American Ever-Ready Works of National Carbon Co.... Los Angeles; 755 Folsom Street, San Francisco; Seattle.

Atchison, Topeka & Santa Fe Railway Co..... 673 Market St., San Francisco; 1218 Broadway, Oakland.

B-2 Benjamin Electric Manufacturing Co..... 590 Howard Street, San Francisco

B-5 Bridgeport Brass Co..... 4 (See Pierson, Roeding & Co.)

B 7 Busch-Sulzer Bros.-Diesel Engine Co..... 11 Rialto Bldg., San Francisco.

C-1 Century Electric Co..... 5 614 South Grand Avenue, Los Angeles; 56 Natoma Street, San Francisco; Seattle; Spokane.

C-3 Crocker-Wheeler Co..... Salt Lake City; Crossley Bldg., 618 Mission St., San Francisco; Seattle.

C-4 Cutler-Hammer Manufacturing Co..... 579 Howard Street, San Francisco; Morgan Bldg., Portland, Ore.; San Fernando Bldg., Los Angeles.

D-1 D. & W. Fuse Co..... 12 Western Electric Co.

D-2 Dearborn Drug and Chemical Works..... 11 355 East Second Street, Los Angeles; 301 Front Street, San Francisco.

D-3 Dover Manufacturing Co..... Canal Dover, Ohio.

E-1 Edison Lamp Works of General Electric Co..... Rialto Bldg., San Francisco.

E-2 Edison Storage Battery Supply Co..... 11 441 Golden Gate Avenue, San Francisco.

E-3 Electric Agencies Co..... 247 Minna Street, San Francisco; Central Building, Los Angeles.

E-4 Electric Storage Battery Co..... Pacific Electric Bldg., Los Angeles; Spalding Bldg., Portland; 118 New Montgomery Street, San Francisco; Colman Bldg., Seattle.

E-5 Electric, Railway & Manufacturers Supply Co..... 84 Second Street, San Francisco.

F-1 Fairbanks, Morse & Co..... 3 Los Angeles; Portland; 651 Mission Street, San Francisco; Seattle; Spokane.

F-3 Federal Sign System (Electric)..... 4 618 Mission Street, San Francisco.

G-1 General Electric Co..... 10 124 W. Fourth Street, Los Angeles; Worcester Bldg., Portland; Rialto Bldg., San Francisco; Colman Bldg., Seattle; Paulsen Bldg., Spokane.

G-2 General Vehicle Co..... 1117 Van Ness Avenue, San Francisco; 331 Wall Street, Los Angeles; British Columbia Electric Ry., Ltd., Vancouver, B. C.

H-1 Habirshaw Wire Co..... (See Western Electric Company.)

H-2 Hemingray Glass Co..... 11 330 So. L. A. Street, Los Angeles; 345 Oak Street, Portland; 807 Mission Street, San Francisco.

H-5 Hunt, Mirk & Co..... 141 Second Street, San Francisco.

H-7 Hurley Machine Co..... 2 New York and Chicago.

I-1 Indiana Rubber and Insulated Wire Co..... Fobes Supply Co., Portland and Seattle.

K-1 Kellogg Switchboard and Supply Co..... Aronson Bldg., San Francisco.

K-2 M. W. Kellogg Co..... (See Pierson, Roeding & Co.)

L-1 Leahy Manufacturing Co..... Eighth and Alameda Street, Los Angeles.

L-2 Locke Insulator Manufacturing Co..... 4 (See Pierson, Roeding & Co.)

M-2 McGlauflin Manufacturing Co..... Sunnyvale, Cal.

M-4 Morse Chain Co..... 6 Monadnock Bldg., San Francisco.

M-3 Moore & Co., Charles C..... 3 Van Nuys Bldg., Los Angeles; Spalding Bldg., Portland; Kearns Bldg., Salt Lake City; Sheldon Bldg., San Francisco; Mutual Life Bldg., Seattle; Santa Rita Hotel Bldg., Tucson.

N-1 Nason & Co., R. N..... 151 Potrero Avenue, San Francisco.

N-2 National Conduit & Cable Co., The..... Trust and Savings Bldg., Los Angeels; Rialto Bldg., San Francisco.

N-3 National Lamp Works of G. E. Co..... (All Jobbers.)

N-4 New York Insulated Wire Co..... 5 629 Howard Street, San Francisco.

N-5 Northwestern Pacific Railroad..... 3 808 Phelan Bldg., San Francisco.

O-1 Okonite Co. (The) ..... 12 (All Jobbers.)

P-1 Pacific Electric Manufacturing Co..... 80 Tehama Street, San Francisco.

P-2 Pacific States Electric Co..... 2 236-240 So. L. A. Street, Los Angeles; 90 Seventh Street, Portland; 200-210 12th Street, Oakland; 575 Mission Street, San Francisco; 307 First Avenue, So., Seattle.

P-4 Pelton Water Wheel Co..... 11 2219 Harrison Street, San Francisco.

P-5 Pierson, Roeding & Co..... 4 Pacific Electric Bldg., Los Angeles; Spalding Bldg., Portland; Rialto Bldg., San Francisco; Colman Bldg., Seattle.

P-7 Pittsburgh Piping & Equipment Co..... 12 Monadnock Bldg., San Francisco.

S-1 Schaw-Batcher Company, Pipe Works, The..... 3 211 J Street, Sacramento; 356 Market Street, San Francisco.

S-3 Simplex Electric Heating Co..... 12 612 Howard Street, San Francisco.

S-4 Southern Pacific Co..... 5 Flood Bldg., San Francisco.

S-5 Sprague Electric Works..... 12 Rialto Bldg, San Francisco; Colman Bldg.; Seattle; 124 West 4th Street, Los Angeles; Electric Bldg., Portland; Paulsen Bldg., Spokane.

S-6 Standard Underground Cable Co..... 3 First National Bank Bldg., San Francisco; Hibernian Bldg., Los Angeles; Yeon Bldg., Portland; Central Bldg., Seattle, Wash.

T-1 Thomas & Co., R..... (See Western Electric Co.)

W-2 Western Electric Co..... Eighth and Santee Streets, Los Angeles; 1901 Telegraph Avenue, Oakland, Cal.; 680 Folsom Street, San Francisco; 907 First Avenue, Seattle; 45 North Fifth Street, Portland, Ore.

W-4 Westinghouse Electric and Manufacturing Co..... 50-52 East Broadway, Butte; Van Nuys Bldg., Los Angeles; Couch Bldg., Portland; 212 So. W. Temple, Salt Lake City; 165 Second Street, San Francisco; Second and Cherry Streets, Seattle; Paulsen Bldg., Spokane.

W-5 Westinghouse Machine Co..... 141 Second Street, San Francisco.

W-6 Westinghouse Lamp Co..... (See Westinghouse Electric and Manufacturing Co.)

W-8 Western Pipe & Steel Co..... 444 Market Street, San Francisco; 1758 North Broadway, Los Angeles.